

Duquesne University Duquesne Scholarship Collection

Electronic Theses and Dissertations

Summer 2008

The Problem of Substantial Generation in Aristotle's Physical Writings

Michael Ivins

Follow this and additional works at: <https://dsc.duq.edu/etd>

Recommended Citation

Ivins, M. (2008). The Problem of Substantial Generation in Aristotle's Physical Writings (Doctoral dissertation, Duquesne University). Retrieved from <https://dsc.duq.edu/etd/686>

This Immediate Access is brought to you for free and open access by Duquesne Scholarship Collection. It has been accepted for inclusion in Electronic Theses and Dissertations by an authorized administrator of Duquesne Scholarship Collection. For more information, please contact phillipsg@duq.edu.

PROBLEM OF SUBSTANTIAL GENERATION
IN ARISTOTLE'S PHYSICAL WRITINGS

A Dissertation

Submitted to the McAnulty Graduate School
of Liberal Arts

Duquesne University

In partial fulfillment of the requirements for
the degree of Doctor of Philosophy

By

Michael Leonard Caraway Ivins

May 2008

PROBLEM OF SUBSTANTIAL GENERATION
IN ARISTOTLE'S PHYSICAL WRITINGS

By

Michael Leonard Caraway Ivins

Approved June 12, 2008

Ronald Polansky, Ph.D.
Professor of Philosophy
(Dissertation Director)

Therese Bonin, Ph.D.
Professor of Philosophy
(Committee Member)

Tom Rockmore, Ph.D.
Professor of Philosophy
(Committee Member)

James Swindal, Ph.D.
Professor of Philosophy
(Department Chair)

Albert C. Labriola, Ph.D.
Professor and Acting Dean, McNulty Graduate School
Of Liberal Arts

ABSTRACT

PROBLEM OF SUBSTANTIAL GENERATION IN ARISTOTLE'S PHYSICAL WRITINGS

By

Michael Leonard Caraway Ivins

May 1, 2008

Dissertation Supervised by Ron Polansky, Ph.D.

Number of Pages in Text: 226

This dissertation explores the relation between Aristotle's account of the generation of substances and his attempt to lay the foundations for his natural philosophy. The central question concerns the injunction posed by the Eleatic philosophers to the study of nature on the basis of the principle "*ex nihilo nihil*" which they formulated into argument against the intelligibility of nature. Aristotle's *Physics* begins with a sustained attempt to defeat the Eleatic prohibition by demonstrating that change in general can be understood once a few principles are established. My reading of the arguments that constitute Aristotle's refutation of the Eleatics and the rehabilitation of the Milesian project of natural philosophy corrects the traditional view that interprets Aristotle's understanding of substantial generation by means of his general account of

change in *Physics* I.7. This correction, however, complicates the issue of the coherence of Aristotle's arguments establishing the legitimacy of the science of nature. To resolve the issues raised here, an appeal must be made to Aristotle's definition of motion in *Physics* III in order to reinterpret Aristotle's account of substantial generation in terms of potentiality and actuality. This definition once properly understood applied as a model for substantial generation allows for a more satisfactory resolution to the Eleatic dilemma.

For my Mother

TABLE OF CONTENTS

<i>Abstract.....</i>	<i>iv</i>
<i>Introduction.....</i>	<i>1</i>
<i>The Origins of Natural Philosophy</i>	<i>16</i>
1.1 Philosophy and Myth	20
1.2 The Beginnings of Natural Philosophy.....	30
1.3 The Eleatic Response: Critique of Natural Philosophy	36
<i>The Argument of Physics I: Legitimizing the Science of Nature</i>	<i>49</i>
2.1 Approaching Nature	52
2.2 The Eleatic Obstacle	58
2.3 Examination of the Doctrines of the Φυσικοί	67
2.4 Generalizing from the Predecessors	71
2.5 Aristotle’s Analysis of the Coming-to-be in General	82
i The Division of the Argument of Physics I.7	85
ii Traditional Interpretations	86
iii Coming-to-be in General	93
iv Generation Proper	99
v Number of Principles.....	106
2.6 Solution to the Eleatic Paradox.....	109
i Reinterpreting the Solution	121
ii Doctors Building Houses.....	123
iii Acting and Undergoing.....	127
iv Dogs Born from Horses	129
v An Alternate Solution	131
<i>Privation and Potentiality.....</i>	<i>135</i>
3.1 Nature as Form and Privation	135
3.2 Differentiation of Μεταβολή and Κίνησης	143
3.3 Substrate and Potentiality in Elemental Transformation	147

<i>Substantial Generation and the Definition of Motion.....</i>	<i>163</i>
4.1 Preface to the Definition.....	166
4.2 Analysis of the Definition	172
i The Charge of Circularity	175
ii The Relations Between the Formulations	177
4.3 Interpreting the Definition	182
i The Actuality View	191
ii Potentiality As Such.....	194
4.4 Motion as Potentiality and Substantial Generation.....	197
 <i>Conclusion.....</i>	 <i>201</i>
 <i>Bibliography</i>	 <i>211</i>

Introduction

Aristotle's *Physics* is arguably the most important work to study in order to understand his contribution to the history of philosophy and science. Despite this, it is the least studied of his major works in modern scholarship likely because of an erroneously perceived obsolescence. Further, his enduring contributions to philosophy and science are not merely of historical interest. Aristotle can provide modern physics with philosophical considerations of fundamental importance to its goal of discovering the truth of nature. His investigations into the essence of motion, place, and time as presented in the *Physics* are crucial to any possible science of nature, including modern mathematical physics. The need to raise this type of question has for the most part escaped the notice of the contemporary sciences, but such questions are as relevant now as they were in his own time.

Since the originators of modern science (primarily Galileo, Bacon, and Descartes), the scientist has been relieved of the obligation to ask such questions. For the most part it is satisfactory, and even necessary, to take as given what the meaning of motion, nature, etc. are, in order to facilitate progress in experimental research. Modern science is in fact founded on a rejection of the kind of

questions that guided Aristotelian investigations. A juxtaposition of two well known passages from Descartes illustrates the modern prejudice:

To render [motion] intelligible, [the Aristotelian Schoolmen] have still not been able to explain it more clearly than in these terms: *motus est actus entis in potentia, prout in potentia est*, which terms are for me so obscure that I am constrained to leave them in their language, because I cannot interpret them. (And, in fact, the words, 'motion is the act of being in potency, insofar as it is in potency,' are not clearer for being in French [English here, of course]. (Descartes *Le Monde*)

Motion... is nothing more than the action by which any body passes from one place to another. (Descartes *Principles of Philosophy* II, 24)

Two things are immediately evident. There is *no refutation* of the Aristotelian doctrine of motion, and there is no explicit effort to understand it. It is arguable that there was no real attempt by the fathers of modern science to refute this conception of motion. They sought simply to *replace* it. Further, the definition of motion that Descartes offers does not determine the essence or meaning of motion but only identifies what *type* of motion ought to be studied, i.e. quantifiable locomotion. Formally speaking Descartes' is not a definition at all insofar as it is gratuitously circular ('*motion* is *passage* in place...'). The circularity of the definition can be ignored by the practicing scientist but not by a philosopher. The scientist can carry on with his work without questioning definitions, but the philosopher cannot. There arises here a gap between modern science and philosophy. The necessity of mending this disparity becomes more

apparent the more distant the truth of the sciences has become from the sense of human experience.¹

The retrieval of Aristotle's insights could act as a corrective device and supplement for the sciences which have perhaps lost sight of their original goal, i.e. to allow the lived world to be understood. This briefly illustrates the general philosophical impetus of the following dissertation and the reasoning behind my recognition of a need for a serious philosophical consideration of Aristotle's investigations into the fundamental principles of nature.

The historical intellectual tradition out of which Aristotle's natural philosophy grew left him with what appeared to many of his contemporaries as insurmountable obstacles in establishing a genuine science of nature.

Parmenides, reasoning that genuine knowledge ought never to change, came to the conclusion that changing things cannot be knowable. Thus the only viable object of genuine knowledge would be solitary and immovable Being.² Aristotle,

¹ Similar remarks could be made about modern science's rejection of teleological causes in nature, of which, again, there was no rationally argued refutation. Such a refutation would require experimentally verifiable demonstration as to the *non-existence* of ends or purposes in nature. This, I submit, is not possible even in principle. Yet the founders of modern science managed to convince the majority of the learned that purposefulness in nature is not scientifically rational and did this without providing a rational justification of their own claim. The foundations of modern science arose either out of a lapse of memory or a willful ignorance of questions such as Aristotle sought to raise. This causes a great deal of trouble when modern science tries to relate its findings to the sense of human experience (for who understands in their experience of light Maxwell's equations [e.g., $c = 1/(e_0 m_0)^{1/2}$]?). Even though the conclusions of Aristotle's investigations can often be considered obsolete, many things found in his natural philosophy square better with human experience than much of the fruits of modern science.

² Heraclitus, on the other hand, came to the same conclusion concerning the impossibility of knowledge of nature: because the whole is constantly in flux, there can be no unchanging knowledge of it and hence simply no knowledge.

however, wished to demonstrate that the changeable world is intelligible in the most rigorous philosophical sense. The greater part of the dissertation follows Aristotle's attempt to establish the legitimacy of the science of nature.

The central difficulty concerns the very intelligibility of change, specifically the kind of change involved in the generation of substances. As Aristotle understood him, Parmenides had leveled a fundamental objection to the possibility of natural science in the form of a paradox seemingly insoluble to reason. Aristotle articulates this paradox of generation in *Physics* I approximately thus: A thing can neither come into being from what-is-not nor from what-is. What-is-not cannot come to be something (for, as the saying goes, nothing comes from nothing), and what-is need not come to be because it already is. This led Parmenides to the conclusion that, because change seems always bound up with non-being, what changes is strictly speaking unknowable (or even, on an extreme reading, non-existent). For Parmenides, what is left for philosophy to speak of and have knowledge of is changeless Being. Some of those, however, who accepted at least partially the charge of unintelligibility suggested by the Parmenidean paradox were led to account for the rationality of change while making do without the genuine coming into being of substances (Empedocles, Democritus, et al.). Aristotle's treatment of change in *Physics* I represents an attempt to establish the possibility of physics as a viable science.

Among Aristotle's predecessors, the attempts to give an account of nature were only successful insofar as they did not recognize substantial generation or even the existence of substances. Thus they did not, in Aristotle's view, fulfill the

task of comprehensively accounting for all of the phenomena of nature. Empedocles, Anaxagoras, and Democritus, for example, were in a way able to make nature intelligible but at the expense of the existence of genuine substances. Yet this is precisely to avoid the Parmenidean paradox where it is most poignant. For to come into being from what-is-not in its strictest sense means to come into being from what-is-not any way a being, and this applies most of all to substantial change. For what changes in place or quality or size must in some sense already be, but when substances are-not they simply do not exist. The result is that in order for Aristotle to resolve the Parmenidean paradox comprehensively for all the phenomena of change, he must make intelligible the generation of substantial beings.

The dissertation arises out of the necessity for a developed consideration of Aristotle's response to the Eleatic critique of natural science and his arguments seeking to establish the legitimacy of such a study. The explicit goal of *Physics* I is to establish the number and character of the principles involved in the study of nature. What is less explicit is that this means Aristotle is going to show that nature is rational and can therefore be the subject for a rigorous science. This requires, in addition to a refutation of the Eleatic denial of the existence of such principles, a critical appraisal of the research of his predecessors as well as an original explanatory account demonstrating the intelligibility of change.

Chapter one of the dissertation sets the intellectual context for Aristotle's investigation into the principles of natural science through a reading of his interpretation of the doctrines of his predecessors in *Metaphysics* I. This text provides insightful comparisons between the first Milesian natural philosophers,

the Eleatics, and the poets. This chapter demonstrates that for Aristotle the difference between these schools of thought is based on an epistemological conflict between them.

Each school of thought carries a particular attitude toward nature and in particular the extent to which it is knowable by human beings. The poets believe knowledge of nature is limited for humans since it properly belongs to divine beings and perhaps a few humans who have the privilege of divine inspiration. The Eleatics claim that a science of nature is impossible insofar as the subject matter itself is incompatible with the character of genuine knowledge. Since the Eleatics suppose that the nature of knowledge is unchanging, they also must hold that the objects of knowledge must be unchanging. Therefore nature, the changing world, cannot be a subject for unchanging knowledge. Only unmoving Being itself is a proper candidate for such knowledge. But since not all of the Eleatics restrain themselves to the realm of Being but make claims also about the world of change, they must maintain an *epistemological* distinction between knowledge and opinion. Natural philosophy, then, is a subject of opinion and cannot be considered a rigorous science. These remarks generally pertain to all of the Eleatic philosophers but they are most explicitly stated by Parmenides. Aristotle makes subtle distinctions between Parmenides, Melissus, and Xenophanes which will be described in more detail in order to clarify the distinction between knowledge and opinion operative in Aristotle's response to the Eleatic prohibition to the study of nature.

In the earliest natural philosophy of the Milesians, the claim to knowledge is implicit. They do not make a distinction between knowledge and opinion but

operate under the assumption that their investigations have a rightful claim to truth. Their immediate competition is the poets whom Aristotle distinguishes from the Milesians on the grounds that they reason and approach nature differently. I argue that the Milesians are the primary subject of the Eleatic critique of natural philosophy and that strangely enough this reflects an affinity between the Eleatic's critique of the Milesian natural philosophy and the attitude of the poets concerning the possibility of knowledge of nature.

The Eleatic response to Milesian natural philosophy constitutes an epistemological critique. Aristotle's response to the Eleatic injunction to the study of nature takes the form of a rehabilitation of the Milesian project that is predicated on the establishment of an epistemological justification of natural philosophy. In the milieu of conflicting opinions about the limits of human knowledge, Aristotle finds himself at odds with the poets and the Eleatics but allied with the Milesians. However, the relationship with Parmenides is complex owing to the fact that Aristotle inherits through Plato a conception of knowledge similar to that of Parmenides. All three of these figures, each in his own way, suppose that knowledge must not be changeable. Plato and Aristotle, unlike Parmenides, expand the domain of what is knowable through the disidenification of the object of knowledge from the being about which there is knowledge. That is, for Aristotle, when you have knowledge of a natural being, knowledge is by means of the *principles* governing and underlying that being. Likewise, Plato allows knowledge of things albeit indirectly through the knowledge of immutable Forms, which are causes or archetypes of natural beings. Even though for Plato

the changeable beings are not knowable in themselves, they are images of things that are in themselves knowable.

The core chapter of the dissertation is devoted to an analysis of the development of the argument of *Physics* I paying particular attention to Aristotle's argumentative strategy. The results of my analysis indicate that Aristotle engineers a response to the Eleatic critique of natural science that takes place in two stages. The first is largely rhetorical and polemical while the second supplies an original account of change that proposes to circumvent the paradox of motion, which is the source of Eleatic bar to the study of nature. In order to understand Aristotle's response to the Eleatics, it will be necessary to provide a detailed reading of the arguments in *Physics* I.2-6 that constitute an initial refutation of Eleatic monism and Aristotle's characteristic review of the doctrines of his predecessors. This portion of the dissertation resembles neoplatonic and medieval commentaries in that it provides a running commentary to Aristotle's text intertwined with an argument that develops along with the text. The necessity for this approach for this portion of text is not only required by its density but by the subtle rhetorical strategies that it employs. Through this close reading, I develop an interpretation showing that the entirety of *Physics* I is an extended argument to establish the legitimacy of natural philosophy.

The review of the predecessors in *Physics* I takes the form of a critique of their views about change. But Aristotle's original account of the principles underlying change is not without difficulties of its own. Aristotle's initial attempt is to offer an account of change that makes use of three principles (two contraries in a persisting substrate). This account has the advantage of being able to

comprehend a large range of the phenomena of nature. However, the one type of change that Parmenides treats as presenting the fundamental road block to understanding change is not easily understood in terms of this three-principled account. In the case of the coming into being of substances the persisting substrate is not readily identifiable. For example, when a seed becomes a full grown organism, the substrate itself (which in this context Aristotle explicitly identifies as the seed) undergoes a transformation so that the identification of some third persisting principle becomes difficult if not impossible.

Traditionally commentators address this by claiming that Aristotle holds a doctrine of “prime matter,” which is a substrate that survives any and all change by virtue of being completely indeterminate. Alternatively commentators who deny that Aristotle held such a doctrine often account for the difficulty of identifying the persisting substrate by claiming that Aristotle’s argument or reasoning is somehow defective. While there is evidence for both of these arguments, the first appears to me to be untenable (the reasons for this opinion are complex and must be addressed later). While I am sympathetic to the idea that the argument is in some way deficient, I reject the idea that this is due to some negligence or misunderstanding on Aristotle’s part. It is more plausible that Aristotle in fact understands the limitations of the argument he presents but that he has no reason to bring attention to these shortcomings. Since his goal is to persuade the reader that the following investigation is worthy of serious study, he would have no inclination to undermine an argument that supports this

belief.³ There is a third view prevalent in literature that attempts to make Aristotle's account of generation coherent by identifying the substrate as in every case something relative specifically to a given change (i.e. the "proximate matter" interpretation). Even this view which is perhaps closest of the three to being correct has critical flaws. I address the shortcomings of each of these positions and in turn provide an alternative view that accounts for the peculiarities of substantial generation.

One of the difficult tasks of chapter two of the dissertation is to demonstrate Aristotle's recognition of the deficiency of the three-principled account. I attempt to do this through a close reading of chapters seven and eight of *Physics* I. Some of the key pieces of evidence for my view are Aristotle's varying usage of the term substrate in the contexts of different kinds of change, his ambivalence about the number principles that must be involved to account for motion, and Aristotle's allusion to an alternate solution that is not explicitly presented. The most difficult aspect of these chapters of the *Physics* is determining the relation between the three-principled account of change in chapter seven and the resolution of the Eleatic paradox of motion in chapter eight, which Aristotle claims follows directly from the analysis in chapter seven. While chapter seven has received a great deal of attention, chapter eight has been left relatively neglected and poorly understood. I seek to remedy this deficiency

³ If Aristotle recognizes that the Parmenidean paradox may not be wholly resolvable and that at the same time he believes that one ought to study nature despite the Eleatic injunction, I see no reason why Aristotle would feel obliged to undermine the credibility of an account that is at least an improvement over other existing accounts.

by drawing the argumentative connection between these chapters and situating them in the context of *Physics* I as a whole.

In the beginning of the investigation proper concerning nature (*Physics* II.1), we find a peculiar absence of the notion of substantial generation. For though he tells us there that the things that clearly exist according to nature are animals and their parts, plants, and the elemental bodies, he tells us that this is most evident insofar as these are subject to locomotion, growth, and change of quality. Yet, what is most evidently natural about these things, however, is that they are primarily cases in which we are likely to identify occurrences of substantial generation.

The conspicuousness of the absence from the list of natural changes at the beginning of the chapter is reaffirmed at its end where Aristotle shows (in an admittedly obscure passage) that nature, in one of its fundamental meanings, means “being born” (in the sense applicable to the generation of plants and animals, which are exemplary substances). The allusion to the problem of substantial generation is made clear in the immediate sequel where he raises an *aporia* arising from this meaning of nature. The difficulty is in what sense “privation” (that from which substantial generation takes place) might be said to have being. That is to say, in what sense *is* that which becomes a substance, for, as we saw before, a thing cannot come from what-is or from what-is-not. Yet he does not address the problem here but defers it to a later investigation. This deferment is an indication of Aristotle’s recognition that the inclusion of substantial generation within the study of nature is not yet secured (this is

accentuated by Aristotle's etymological pun, for it becomes a question of whether "to grow" or "to be born" (φύεταί) can be a subject of the science of "nature" (φύσις).

Before approaching the definition of motion, the last section of chapter three begins to clarify the issue raised in *Physics* II.1 concerning character of privation involved in the generation of substance. Here I provide a reading of passages from *On Generation and Corruption* that address the general subject of potentiality as a kind of privation and the specific example of the transformation of elements which serve as an archetype for the generation of substances. These passages illustrate the difficulties that arise when a potentiality is conceived of that does not have any positive predicates. That from which a substance comes to be (what-is-not a substance), when it is conceived of as a potentiality, would be precisely this sort of being.

In the forth chapter I bring Aristotle's definition of motion to bear on the problem of substantial generation. The central question is whether and in what sense substantial generation can be understood by means of the definition of motion. In *Physics* V, Aristotle draws a distinction between motion and change the latter being the wider category encompassing the former. The only species of change that does not belong to the narrower category of motion is substantial generation. Aristotle makes this claim on the grounds that the role of the substrate in substantial generation differs from that in locomotion, growth, and qualitative change. He does not however make explicit that the definition of motion is meant to apply to the wider category of change or that substantial

generation should be included in that definition.⁴ This chapter provides an extensive discussion of Aristotle's definition of motion that shows that it is first of all a coherent understanding of motion and which illustrates how substantial generation can be understood by it. The definition of motion proves to be helpful in solving the Eleatic paradox by understanding the substrate involved in any change as a potentiality that remains. This interpretation also acts as a reconstruction of the alternate solution to the Eleatic dilemma alluded to in *Physics* I.8 where Aristotle tells us that the ideas of potentiality and actuality could be appropriately applied to the problem without telling us how or where he does so.

Comment on Method

The general strategy of investigation will involve close reading of the portions of Aristotle's physical writings that deal with the problem of substantial generation. Aristotle's texts are not loosely compiled lecture notes or sketches but are carefully constructed scientific prose. The analysis of such texts requires the utmost attentiveness to word choice, form of argument, and the context in which the specific arguments occur. As much as is possible, it will be necessary to follow strictly the best surviving texts of the Aristotelian corpus without

⁴ The distinction made in *Physics* V.1 appears even to go so far as to remove substantial generation from being a form of motion (κίνησις) in the strictest sense. It will be of the utmost importance to determine whether or not substantial generation can be understood to fall within the bounds of the definition of motion as given in book III. For "since," as Aristotle says, "nature is a source of motion and change," this will aid us in determining in what ways an account of substantial generation can or cannot be included in the science of nature.

succumbing to the temptation of interpolation or textual emendation (our own or that of modern editors).

The question of the chronology of Aristotle's texts will have the least possible bearing on my interpretation. On top of the fact that ultimately there is no way to establish a satisfactory chronology (though there may be sufficient evidence to date some of the works), the employment of such a framework opens the danger of reconciling apparent contradictions found in Aristotle's text in a way that obfuscates a genuine Aristotelian problem or intention. The fact that there are contradictions in Aristotle's texts is undeniable. But if we are open to the possibility that Aristotle need not have felt he had to solve every problem once and for all, the reconciliation of such contradictions allows the possibility of bearing more fruit than dismissing an "earlier" view in light of what we take to be a "later" and more mature view.⁵

It will also be necessary to take care not to take arguments out of the context in which they were written. This caution will not disallow cross-referencing relevant passages from texts other than that being analyzed, but it

⁵ More often than is generally recognized, Aristotle does not provide decisive conclusions to the problems he raises. This is especially the case when dealing with the most fundamental issues. It is therefore necessary to be extremely sensitive to what he does or does not ultimately conclude in a given series of arguments. He often suspends judgment about the most important problems and wishes to bring the reader to a developed state of constructive *aporia*. This I believe stems from recognition on Aristotle's part that some philosophical problems ultimately offer no definitive solution. What he will offer the reader then is the best possible way of handling a given problem in order that the reader may be equipped to deal with the deepest philosophical problems on her own. These are important and too often overlooked aspects of Aristotle's dialectical method.

will guard against importing ideas that Aristotle is purposely withholding from a given argument. For example, we will respect Aristotle's reticence to employ the concepts of potentiality and actuality in his initial account of substantial generation in *Physics* I, though we will be compelled to consider why he chooses not to do so.

Even though book divisions, chapter divisions, and even paragraph breaks in Aristotle's texts are artificial creations of later editors they reflect a deep consideration of the argumentative structure of Aristotle's works. My approach to the text respects this to a high degree. It is uncommon for me to make appeals to passages outside of the immediate context of an argument under consideration in order to provide crucial support for my interpretation. As will be especially evident in Chapter 2 where I give a sustained interpretative reading of *Physics* I, even the relations between chapters in a given book can provide deep insight into the matters under consideration. Understanding the argumentative structure relies heavily on the order and manner of presentation insofar as Aristotle's writing is engineered in specific ways to guide the reader to an insight or *aporia*. The one substantial excursion from the text of the *Physics* is *On Generation and Corruption*, but it relates to the material in the *Physics* by addressing themes not touched upon in much detail in the *Physics*, i.e. the question of Prime Matter and the exploration of the idea of potentiality as it relates to coming into being.

Chapter 1

The Origins of Natural Philosophy

We his students, however, wish not only to remember the man but also to entertain our children and audiences with his speech.

-Diogenes Laërtius' *Lives of Eminent Philosophers*, I.39
(speaking of Thales)

The love of truth, faith in the power of the mind, is the first condition of Philosophy.

-Hegel's *Lectures on the History of Philosophy*

The intention of this chapter is to provide a preparatory narrative dealing with a narrow selection of Aristotle's predecessors insofar as they posed the questions which constitute the earliest insights into nature and which serve as guideposts for Aristotle's natural philosophy. The interest here is to gain insight into how Aristotle understood the relation of his own inquiries into nature to those of his presocratic predecessors. This will provide guidance when we begin

to approach themes in the dissertation that I claim are central to Aristotle's thinking in natural philosophy. This is especially the case with the issue of the generation of natural substances which I believe lies at the heart of Aristotle's thinking of nature and which has its roots in the thinking of his predecessors. These thinkers were the first either to put forward physical doctrines or to concern themselves with what we might call the epistemological problem of the changing world. The most relevant aspect of this early history of natural philosophy for the purposes of approaching the foundations of Aristotle's investigations into nature is determining the relation between the groundwork of natural philosophy established by the Milesians and the critical response it received from the Eleatics.⁶ The dynamic between these two groups in particular captures the essence of a tension found in Aristotle as well as in Plato between the desire to put forward truthful accounts of the natural world and the recognition that the standard by which genuine knowledge must be measured may be higher than any possible knowledge of the natural world.

In order to understand the importance of Aristotle's physical inquiries, we must begin by looking at some of the founding thinkers who investigated nature

⁶ The question of whether or in what sense these two groups constitute 'schools' in terms of actual associations is not wholly irrelevant. I am less interested in the historiographical and philological questions than in the progression of ideas more or less explicit in these thinkers. Thus for present purposes the interest is more in following the history of ideas that leads up to Aristotle's attempt to justify natural science as a field of knowledge in the most rigorous sense. For a comprehensive guide to both the actual historical details of the earliest Greek thinkers as well as their contributions to the history of thought I refer the reader to Kirk, Raven, and Schofield's *Presocratic Philosophers* (1983, abbreviated KRS from here on).

so that we may understand their influence on Aristotle.⁷ Aristotle's project is in a certain sense aligned with neo-Ionian natural science (Empedocles, Anaxagoras, Leucippus, perhaps Heraclitus, *et al.*) in that he seeks to revive the Milesian project of adequately understanding nature by discovering the principles that underlie it while at the same time overcoming the problems posed by the Eleatic critique which threaten to negate any claim to genuine knowledge concerning the natural world.⁸ Aristotle inherits from the Milesians the project of investigation into nature and from the Eleatics the standard of knowledge by which such an investigation must be judged if its findings are to be considered bona fide knowledge.⁹

The basis of this Eleatic critique arises from the consideration of an apparently irresolvable paradox of motion, namely that that which comes to be must come to be from either that which is or that which is not, either of which is impossible. For that which is need not come to be since it already is, and that

⁷ To gain some historical perspective on the importance of these thinkers as well as Aristotle, we should realize that they initiated a tradition of natural scientific inquiry which spanned an epoch at least four times as long as the modern scientific tradition which we immediately inherit. Determining these motivations is not only profitable for its own sake, but because the questions of the early inquirers into nature formed the basis of the investigation of Aristotle's *Physics*, we will find our way into one of the central problems at the heart of Aristotelian physics by means of them, namely the problem of the intelligibility of motion as such.

⁸ The distinction between the Milesians and the neo-Ionians is theoretical rather than geographic. Miletus was the city in Ionia where Thales, Anaximander, and Anaximenes resided. The neo-Ionians, whatever their geography, are called such primarily because they take up similar directions in the study of nature.

⁹ Of course, both of these inheritances are mediated by Plato who undoubtedly shaped Aristotle's views of these thinkers. The study of Plato's influence on Aristotle's history of philosophy would be an interesting and immense project beyond the scope of the present essay. Cherniss' work on Plato and Aristotle's interpretations of the presocratics would be an excellent starting point for such an investigation (cf. Cherniss 1964 and 1944).

which is not cannot be that from which something comes to be since nothing can come to be from nothing (cf. Parmenides fr.8, 5 ff. and especially 18-21; cf. also *Physics* I.8 191a25 ff.). The Neo-Ionians, generally speaking, manage to overcome the first horn of the Eleatic dilemma by supposing that the material substrate or substrates of the natural world are themselves eternal so that despite the fact that physical things come to be and pass away, there is always something immutable out of which they come to be and into which they perish while themselves never coming into being or perishing in an absolute sense.

The figures that I focus on in this introduction constitute an admittedly selective group. I touch upon Hesiod, Thales, and Anaximander relatively briefly and spend considerably more time grappling with Parmenides and the Eleatics' critique of cosmological and physical theorizing.¹⁰ The Eleatic critique is of fundamental importance in that it sets the point of departure for Aristotle's argument legitimating the science of nature and in particular the central problem of the generation of natural substances. What is most important for the purposes of the present investigation is to see what exactly it is that Aristotle is responding to when in the first book of his *Physics* he takes pains to argue that change (and *a fortiori* nature) is knowable by means of rational principles.

Let us begin by looking at the origins of the investigations into nature in the Greek tradition by considering two founders of Greek thought, Hesiod and Thales. The distinction between them will be the guiding thread in addressing

¹⁰ For the sake of brevity in this chapter I refrain from discussions of Empedocles, Anaxagoras, the Atomists, Pythagoras, and the Pythagoreans who all in their own way formulate responses to the Parmenidean critique. There will be opportunity to return to some of these figures in looking at Aristotle's review of predecessors in *Physics* I where he shows the limitations of some of their responses to the Eleatic dilemma.

the problem of what motivates one type of thinker to approach nature in terms of rational, “scientific” principles rather than accepting or elaborating traditional, mythical cosmologies and cosmogonies. The importance of this will become clearer as we begin to see that not only do some of the presocratic thinkers specifically set themselves over against the tradition of the poets, but that on several occasions Aristotle himself explicitly marks the poets as adversaries to his natural scientific research.¹¹ This immediately brings us to an examination of the key differences that Aristotle identifies between philosophers and poets and indeed among the philosophers themselves to the extent to which they suppose that the study of the natural world is a subject of knowledge or opinion.

1.1 Philosophy and Myth

The discussion of the question of the origin of philosophy in the west traditionally sets itself the task of locating in time a transition which takes place from pre-scientific, mythical-poetical attitudes to rationalistic scientific thinking about the world.¹² Hesiod and Thales are often invoked as prototypes representing poetic and scientific approaches to understanding the natural

¹¹ For example, Aristotle cites Hesiod as holding a certain view of place which must be considered alongside other alternative theories (*Physics* IV 208b29). See also *Metaphysics* I 983b29 ff.

¹² This attitude is largely anachronistic in the context of contemporary scholarship but there is a persistent presence of it in popular views and text books on philosophy. Since Dodds’ important work *The Greeks and the Irrational* (2004) published in the mid-twentieth century this attitude is much less common. The work of French classicists Brisson (2008), Vernant (1983 and 2006), and Detienne (1999) have done much to help dispel the legitimacy of this point of view.

world.¹³ The differences between these two figures are meant to provide the basis for the idea that there is a gulf separating reason and non-reason, or myth and logos. It is the historical transition from the dominance of one kind of thinking to the other, or from the evolution of one out of the other, that we are meant to grasp as the birth of philosophy out of irrationality.

Another typical strategy for making the distinction between the poets and the first philosophers is to say that the latter became concerned with different subject matters. It was no longer the Gods that they wanted to talk about but rather nature. Direct and anecdotal evidence both contradict this. It is clear that both poets and natural philosophers often address the same subject matter. Take, for example, questions concerning the genesis of the cosmos, the nature of man, and subjects relevant to political life. The presence of all of these themes is evident in Hesiod's *Theogony* which treats many cosmological themes. But if it is not in the subject matter that the distinction comes to light, perhaps it is apparent in the mode of writing with which they choose to communicate. It is clear however that if one tries to reduce the distinction poets and philosophers to a matter of narrative style, one finds immediately that this distinction is inadequate as well. For example, one cannot distinguish Parmenides or Empedocles from the poets on the grounds of style or mode of expression alone

¹³ One example among many is Zeller: "He [Thales] is at any rate the first we know to have instituted any general enquiry into the natural causes of things, in contradistinction to his predecessors, who contented themselves partly with mythical cosmogonies, and partly with isolated ethical reflections" (Zeller 1881, 216).

given that they both wrote in verses which in fact resemble closely the style of Hesiod.¹⁴

The common mistake is to look too much into form/content distinction and ignore differences in *motivations and presuppositions* which underlie the particular way that the philosopher approaches and talks about the world which he investigates in contrast to that of the poet. It is precisely the insight into the differences in motivation which underlie Aristotle's treatment of the Hesiod and the natural philosophers in *Metaphysics* I.¹⁵ Aristotle's survey of his

¹⁴ Both Parmenides and Empedocles are traditionally thought of as representing the philosophic and scientific type. However, recent scholarship on Parmenides and Empedocles (including the discovery of new manuscripts in the latter) has allowed scholars to entertain the distinct possibility that there is a stronger religious and poetic subtext in these thinkers than has previously been thought. Consider particularly the work of Peter Kingsley on both Parmenides and Empedocles as well as the literature on the newly discovered Empedocles manuscripts. Cf. Kingsley 1999 for Parmenides and Kingsley 1997 and 2002 for Empedocles. See the introduction to Inwood 2001 for the significance of the newly discovered Empedocles manuscripts.

¹⁵ Aristotle's accounts of his predecessors and of the origins of philosophy have been criticized consistently on the grounds that he views them through the lens of his own philosophical project. Especially Cherniss who devotes his important book *Aristotle's Criticism of Pre-socratic Philosophy* to the systematic prosecution of Aristotle on this point. Indeed he admits as much: "But the purpose for which we are recounting these things is this: that we might understand from these people both what they set down as causes, and how they fall in with the kinds of causes described [by us]" (986a14). This statement is made in the context of Aristotle's account of Pythagorean number theory but clearly refers generally to his examination of his predecessors as a whole in *Metaphysics* I. Even though our purpose here is not primarily to reconstruct the historical origins of philosophy, we must make some effort to distinguish Aristotle's accounts of his predecessors with the little evidence we have from the presocratics in the surviving fragments.

We must always keep in mind that however 'objective' we wish to be in disarming the influence of Aristotle on our view of the presocratics, Aristotle, along with Plato, provide us with our primary means of access to understanding them. Gadamer believes that Plato and Aristotle's influence is to some extent unavoidable but that the hermeneutic challenge is to overcome this influence as much as is possible by contrasting the various accounts of the presocratics from different historical periods (Gadamer 2001, 33 ff.). Less historically minded commentators often make the mistake of taking for granted that there is a transparent lens of objectivity that allows them to see through the distortions of history as if they did not exist. The most obvious prejudice is easily recognizable from the very fact that we refer to this group of thinkers as 'pre-

predecessors in *Metaphysics* I, as I hope to show, constitutes an argument which not only distinguishes philosophers from poets on the grounds of distinct attitudes towards nature, but more fundamentally constitutes an argument which makes this distinction based on their respective epistemological commitments. That is whether, how, or to what extent the poet or philosopher believes human beings can obtain genuine knowledge of nature.

In the first book of the *Metaphysics* Aristotle tells us several things about Hesiod, what he has in common with and how he differs from figures more recognizable as philosophers, i.e. Thales and Parmenides. The arguments contrasting Hesiod with Thales and Parmenides revolve around the question of the original authorship of the four Aristotelian causes, but they also serve to reveal fundamental differences between the poetic and scientific approaches to understanding nature. Aristotle tells us that Hesiod: 1) is considered by some to

socratics,' a name which reflects that these thinkers are already thought retroactively in terms of a lineage that begins with Socrates and follows through Plato and Aristotle. Thus there is really something to Nietzsche's insistence (Nietzsche 2001) that we refer to these thinkers as pre-platonic insofar as whatever picture we have even of Socrates is Platonic (and of course Xenophonic though perhaps less so). There is no way to absolutely circumvent this influence given the fact that the majority of the surviving fragments of the presocratics are handed down to us through other ancient sources.

The most systematic attempt to dismantle the Aristotelian influence on our understanding of the presocratics is Cherniss' important work *Aristotle's Criticism of the Presocratic Philosophers*. But even here one cannot escape the suspicion that the means of the deconstruction is artificial and anachronistic. More recently Jaap Mansfeld has taken up the question of how to understand the presocratics while avoiding the strong influence of Aristotle's colored testimony by making an explicit appeal to contemporary distinctions between philosophy and science (Mansfeld 1990). Mansfeld however only succeeds in making explicit the a-historical approach that is common to the methods of the majority of contemporary accounts of the presocratics. For while they seek to circumvent the Aristotelian influence, they often do so without justifying why this is better than, and not essentially equivalent to in principle, Aristotle's interpretation. Our approach accepts a certain inevitability of reading Aristotle into the predecessors while being conscious of the difficulties it entails. However, the difficulty affects us less as it is ultimately Aristotle that we are hoping to understand.

have anticipated an account positing a single material substrate underlying nature (983b29)¹⁶, 2) claims that the earth was the first of the bodies to come into being (989a10)¹⁷, 3) may have been the first to catch a glimpse of final causes (984b24). With regard to at least two of the four Aristotelian causes (material and final), Aristotle entertains the idea that Hesiod may have some right to the claim of discovery. With regard to material cause, Hesiod loses out to Thales who is called the originator of “this sort of philosophy,” the sort, I take it, that gives an account grounded in ordinary experience of nature which prioritizes the constituents of natural things as their most real attribute.

For Aristotle, what distinguishes Thales from Hesiod and other “ancient theologians” is also the *way* he speaks: “But whether this opinion about nature is something archaic and ancient might perhaps be unclear, but Thales at least is said to have spoken *in this way* [οὕτως] about the first cause” (984a2).

Aristotle’s reconstruction of Thales’ reasoning that the source and primary constituent of nature is water shows what it is that distinguishes his way of thinking from Hesiod and the poets.¹⁸ Namely, there is in Thales a reasoned

¹⁶ The reference is general enough to refer also to Homer or perhaps other poets or ‘ancient theologians’ as he sometimes calls them as a group. The important distinction here is whether a certain type of thinking represented by Thales and a type represented by those who make Ocean and Tethys the origin of things were the first to posit water as the original source.

¹⁷ Cf. also (Aristotle’s representation of) Hesiod’s claim that “first of all things chaos came into being, but then broad-breasted earth” (*Physics* IV 209b30). Aristotle considers Hesiod’s statement among those of natural philosophers who investigate the nature of place.

¹⁸ Namely, from Thales’ supposed experience that for living things and heat in general, fluid both sustains and is the origin of these, he must have, according to Aristotle, reasoned further that the source of these things is water because water “is in turn the nature of fluid things” (984a22 ff.).

account which makes a direct appeal to something of which we can have firsthand experience. This employment of experience and reasoned account mark the decisive difference between Thales and the poets. The underlying supposition is that Thales believes that mundane experience and reasoning constitute a legitimate source of knowledge about nature. The authority of Hesiod's account does not come from direct experience of nature but rather from the claim of inspiration from a divine source and therefore a privileged experience.¹⁹ Even if both the poets and the first natural scientists are interested in what constitutes the cosmos and from whence it came, they approach the subject with different presuppositions about humankind's capacity to have genuine understanding of the world he inhabits.

Hesiod's rival for the claim to the discovery of the final cause in nature is, surprisingly, Parmenides. Both of them are seemingly the first to posit love (ἔρος, 984b24) as a cause and this Aristotle takes to be a forerunner of his notion of final cause: "as though there needed to be present among beings some sort of cause that would move things and draw them together" (984b30). Curiously, Aristotle postpones deciding between Parmenides and Hesiod making a promise he appears never to make good on (cf. 984b31).²⁰ The fact that Aristotle makes no immediate decision as to who originated the notion of final cause suggests that as far as the subject matter which concerns the philosopher and the poet there

¹⁹ After a lengthy 24 line catalogue of divinities, Hesiod begins the substance of his poem with this invocation: "And one day they taught Hesiod glorious song while he was shepherding his lambs under holy Helicon, and this word first the goddesses said to me - the Muses of Olympus, daughters of Zeus who holds the aegis" (H.G. Evelyn-White 1914, line 25).

²⁰ Cf. J. Mansfeld 1990, 206.

are areas of overlap such that making a definitive distinction proves to be difficult. Further, because Aristotle does not distinguish between Parmenides and Hesiod on the grounds of their approach to understanding nature which would parallel the distinction between Hesiod and Thales, we can infer that Parmenides and Hesiod may be in some sense more akin than Hesiod and Thales. Even the manner in which Parmenides articulates the notion of final cause is more poetic than scientific or philosophical in that the final cause takes the form of the goddess herself.²¹ This is less puzzling once we consider that Parmenides' physical theories are presented as if they were revealed to him by the goddess he invokes in his poem.²² Even if the content of Parmenides' physical theories closely resembles the kind of account one typically finds in natural philosophy of the age (employing the notion of oppositions, material principles, etc.), one cannot overlook the significance of the fact that Parmenides does not claim to have derived these insights from a study of nature but rather from inspiration of his muse the goddess.

Aristotle accentuates the difficulty of distinguishing mythical and rational accounts of nature when he tells us that there is even something 'philosophic' about the poetic type: "But someone who wonders and is at an impasse considers himself to be ignorant (for which reason the lover of myth is in a certain way

²¹ Cf. Parmenides' fragment 12: "for she [the goddess] governs the hateful birth and mingling of all things, sending female to mix with male, and again conversely male with female" (KRS 1983, 258). Cf. also KRS (1983, 260): "It is unclear whether Parmenides' divine first cause is anything more than a metaphor for the mutual attraction exercised by opposite forms, although there is no room for such a cause in the ontology of fragment 8, 53-61."

²² Cf. Parmenides' fragment 1: "And the goddess received me kindly, and took my right hand with her hand, and uttered speech and thus addressed me" (Parmenides 1991).

philosophic, since a myth is composed of wonders)” (982b19). The same sense of ignorance which drives the philosopher in his journey from wonder to understanding is also present in the poets who in turn manifest that wonder in others by means of his or her art. The poets seem to be engaged in an activity that causes men to wonder and in this way is ‘philosophic’. But not only are the works of the poets the *causes* of wonder, their works are narratives which describe things about the world itself that make men wonder.

Yet the poets, according to Aristotle, are misguided at least in this: they regard the highest knowledge concerning the mysteries of nature as appropriate only to the gods. From the point of view of the poets who believe that “the nature of the divine power is to be jealous” the philosophical project of the attainment of ‘divine’ knowledge about the world appears to be impious (982b29 ff.). And indeed there must be some hubris in supposing that even the wisest human being could have absolute knowledge about the whole which could in principle belong only to a non-finite being or a being that was not a part of the whole which is supposed to be the object of knowledge. If the poet makes claims about nature or anything else, he or she generally does so under the authority of a divinity or muse. From the point of view of the poet, it is an act of impiety for the natural scientist to make such claims on the grounds of human reason and experience alone.

Even if the philosopher acknowledges certain limits to what he or she can genuinely know about nature and from this attains to a certain (Socratic) humility, it is better to advance beyond the position of the poets who believe that human beings with their limited capacities cannot attain to genuine knowledge of

the world without the aid of the divine.²³ For the poets, the only cure for human ignorance is the divine grace of a muse or other divinity. From this point of view, what distinguishes the philosopher from the ‘ancient theologians’ is not reducible to the use of rational argument, a non-anthropomorphic perspective about the gods, or even the subject matter of their discourses. Rather, it is what they understand to be the limits of the human capacity to experience and understand as well the attitude towards the human striving to genuine knowledge that is ultimately the distinguishing feature between the poets and the early natural philosophers.

i Philosophy and Science

There has been a growing trend to make the further distinction between philosophy and science though traditionally these have been held to be inseparable in early Greek thought. Jaap Mansfeld epitomizes this trend in an explicit rejection of the Aristotelian account of the origins of philosophical thought, a rejection which deserves critical appraisal:

Although my (far from wholly original) approach may perhaps be dubbed anachronistic, I believe that the best way of tackling the solution, and of rephrasing Aristotle’s question [as to the origins of philosophy], is the drab, pragmatic one of taking as one’s basis those activities and procedures which, at the moment, are assumed to be philosophical by the large majority of professionals, and to exclude from consideration what is outside the field worked by

²³ This whole line of reasoning could be seen as the poetic precursor to the Eleatic critique of natural science. The result of Eleatic skepticism, especially visible in Parmenides, is that the authority of our opinions about the natural world rests ultimately on an appeal to the divine, in his case the goddess he invokes and is guided by throughout the poem.

these professionals. [...] Philosophers, however, do not study the things that are studied by the scientists, but contemplate the activities and theories of the scientists themselves. Modern epistemology and philosophy of science are remote descendants of Aristotle's "first philosophy." (Mansfeld 1990, 209)

Mansfeld's view is clearly and intentionally a departure from the Aristotelian view in that it rejects the idea that "second philosophy" (the study of nature) deserves the name of philosophy at all. What is not made clear is what the motivation might be for the dismissal of the Aristotelian account of the difference between philosophy and myth (as well as the kinship of first and second philosophy) in favor of the modern distinction between philosophy and science. Ironically, the argument loses much of its force precisely because it rests on a presupposition which is commonly held by "the large majority of professionals," namely the questionable presuppositions that the modern distinction between philosophy and science is, first, in itself valid, and second, rightfully applicable to the analysis of the origins of ancient thought. The basis for this proposed reassignment of the notion of what constitutes philosophy is found in the initial development of modern science from Bacon to Galileo to Descartes. They collectively narrowed the scope of what could be deemed genuine science contrasting it with "speculative philosophy," a term which becomes derogatory only from the perspective of the new meaning of science.

Mansfeld's view can only be made from the point of view of the modern thinker who has conceded to modern science what was originally the domain of philosophy. While it may be true as an historical matter of fact that the modern sciences have usurped the authority of philosophy in the explanation of "the world and man," we should not cease to wonder if this accession is justifiable and

not merely on its own terms, that is, on the grounds of modern science's utility. Mansfeld claims that it is in Parmenides' "critical" approach to the work of the Milesian natural scientists that we find the first seeds of what should properly be called philosophy. On his account, Parmenides' critical project is furthered by Aristotle's *Metaphysics* insofar as "modern epistemology and philosophy of science are remote descendants of Aristotle's 'first philosophy'" (Mansfeld 1990, 209, cf. also 205-6). Mansfeld virtually ignores the poetic, mythical or divinely inspired aspect of Parmenides. The direct connection between Parmenides and modern philosophy of science is not only questionable because Parmenides seems to ground his critical claims by making an appeal to a goddess which speaks through him, but also in the fundamental difference in aim. If it could be said that modern philosophy of science is concerned with understanding the conditions under which the modern sciences are possible and valid (a distinctly Kantian project), Parmenides is interested more in demonstrating the conditions for the *impossibility* of natural science. In this sense they are opposed as positive to negative.

1.2 The Beginnings of Natural Philosophy

There is scant evidence about the reputed first natural philosopher, Thales. From Aristotle, we know of his physical philosophy primarily through two claims regarding the principles of nature. The first is that Thales may have thought that the underlying principle of the natural world was water (or more likely, as Aristotle reports before he begins his own conjecture, that the Earth

‘rests’ on water, cf. *Metaphysics* I.3 and *De Caelo* II.13).²⁴ The second is that he may have said that some material things have ‘souls’: “All things are full of Gods!” (*De Anima* I.5). This latter may have been meant to highlight the mysteriousness of the phenomenon of self motion in natural beings rather than act as an attempt to explain some aspect of nature. In addition to these, he is rumored to have been a top rate astronomer and mathematician.²⁵ It is the first point that is most important for us as it establishes a tradition of positing one thing or another as the fundamental substance underlying all of nature.

Thales is thought to be the first to posit a single material reality as the basis for the understanding of nature’s origin and composition. The effect of such an assertion is double: by appealing to our experience of the fluid nature of water, he allows us to imagine that what underlies nature is both a single thing *and* a thing that is almost unqualifiedly malleable. Thus, in thinking of the primary reality of nature as a single substance, and highly plastic one, Thales unifies ever changing nature under a single thought. This is a thought which,

²⁴ Aristotle’s reconstruction of Thales’ thought in the *Metaphysics* is most likely anachronistic: “getting hold of this opinion perhaps from seeing that the nourishment of all things is fluid, and that heat itself comes about from it and lives by means of it (and that out of which things come into being is the source of them all). So he got hold of this opinion by this means, and because the seeds of all things have a fluid nature, while water is in turn the source of the nature of fluid things” (984a21 ff.). Gadamer believes Aristotle’s interpretation is out of place with Thales’s time: “Aristotle says with subtle reservation that the thesis put forward by Thales, namely, that water is the originary element, follows from the observation that there is no life without moisture. That does not correspond to the sixth-century cosmological-cosmogonic way of thinking” (2001, 78).

²⁵ I refer the reader to KRS (1983) for a full discussion of Thales’ achievements and biography as well as for more comprehensive accounts of all of the thinkers I treat in this section. For a provocative intellectual narrative of a selection of presocratics see Nietzsche’s *The Pre-Platonic Philosophers* (Nietzsche 2001).

moreover, allows us to think of the constancy in nature at the same time as we think its changeability.²⁶

This is the great achievement of Thales, for it begins the quest to find principles that can account both for nature's stability as well as its variability, the essential paradox of nature. This apparent contradiction in nature may in fact be *the* motivating force underlying Greek natural philosophy. Presumably, it was some recognition of this strange aspect of nature as well as the inevitable paradoxes that arise when considering the origins of nature that made Thales wonder and motivated him to look for a way of understanding nature in terms familiar to everyday human thought. Thales represents, according to this interpretation, the first attempt to present a unifying account of nature by positing water as a substrate in order to illustrate and explain with one concept a fundamental complexity of nature, i.e. the fact that nature is ever changing and yet exhibits some regularity and sameness. In Hellenic philosophy this quest ostensibly finds its culmination in Aristotle.

Following Thales in the early history of Greek natural philosophy is Anaximander who both carried on and radicalized the work of his predecessor. Anaximander is considered to be roughly contemporary with Thales though slightly his junior. Unfortunately, we have almost as little textual evidence about Anaximander as we do about Thales, though at least one fragment survives. Even in this very brief passage we find collected themes that are central throughout the

²⁶ Perhaps both in the sense that water in its liquid form can take on a shape given by a container and in virtue of the fact that we find water in three states: gas, liquid, and solid. (Of course, this latter observation may stem from a more modern concern.)

tradition of natural science and which will be systematically explored by Aristotle in his *Physics*, namely: time, the infinite, necessity, and the theme of the generation and destruction of the cosmos and of all beings.

... some other infinite [indefinite, ἄπειρον] nature, from which comes into being all the heavens and the worlds in them. And the source of coming-to-be [γένεσις] for existing things is that into which destruction, too, happens according to necessity; for they pay penalty and retribution to each other for their injustice according to the assessment of Time.²⁷ (KRS 118)

Anaximander inherits from Thales the notion of a substrate underlying nature.

However, he rejects Thales' the idea that water is the fundamental substrate of

²⁷ The actual length of the fragment thought to belong to Anaximander has been a subject of much debate because of the peculiarly Aristotelian language of the text paired with the fact that the text is preserved through the intermediaries of Simplicius who often paraphrased passages cited from ancient sources, as was common practice for commentators. This coupled with the fact that there is no absolutely clear way in ancient Greek to determine where commentary ends and quotation begins makes the determination of what properly belongs to Anaximander difficult and ultimately a subject of speculation. What strikes the ear as most Peripetetic is the employment of what became for Aristotle and his followers technical terms: γένεσις and φθορά. For this reason, it is often thought that only the end of the fragment is an authentic phrase of Anaximander, the introductory lines being the paraphrase of Theophrastus (cf. KRS 1983, 118). However, there is even something distinctly Aristotelian about the sense paying retribution "to each other" (ἀλλήλως) for injustices which brings to mind the Aristotle's characterization of change as the exchange of contraries. In the 19th century, Aldine "inadvertently omitted" the phrase which was eventually "restored from the MSS by Usener and Diels" (Heidel 1980, 233-4; see Kahn 1960, 194-5 and Nietzsche 2001, 191-3). The absence of the phrase allowed for an interpretation that is interesting in its own right but was probably more obscure than helpful. Without the "to each other", the fragment was interpreted by Nietzsche as saying that recompense for injustices committed is paid by beings in the realm of becoming to the eternal ἄπειρον (the realm of being) for the crime of emancipating themselves from being. Thus we are given an image of a sort of cosmic cycle in which the entire cosmos is born from and returns to its source in the cycle of crime and requital. Once the "to each other" phrase is included in the fragment, it allows an interpretation more in line with Peripatetic doctrine. In this case it would be the *things* that coming into being and pass away (which is general enough to include qualities, substances, etc. in the Aristotelian framework) that pay mutual retribution. Despite the difficulties of attribution, we will risk erring on the side of generosity and take the longest reasonable portion of text as genuinely belonging to Anaximander. For a more extensive discussion of the problem of the length of what is supposed to be genuinely Anaximander's see G.S. Kirk 1970, 340-7.

nature. It is the ἄπειρον from which beings come to be and to which they pass back. Thales' water must have seemed to Anaximander still too determinate to serve as the substrate for the material world. Perhaps it did not seem fitting to Anaximander that the very thing that one posits as a principle for change for the natural world is in fact a visible part of that world.²⁸ According to Aristotle, Anaximander may have been concerned that positing water as the substrate (or any other perceivable element) would not guarantee that the cosmos would never exhaust itself.²⁹ The ἄπειρον could serve as a kind of inexhaustible material motor of the cosmos ensuring that the cycle of changes among the world's constituents would never cease.³⁰

²⁸ This is of course taking the most literal interpretation of Thales' claim. It does not seem unlikely however that a reasonable thinker might use a metaphor in trying to explain as abstract as the principle of the cosmos.

²⁹ *Physics* III 203b13 and consider 208a10. Cf. Kirk 1970, 330. Aetius and Theophrastus confirm this as well (KRS 1983, 330).

³⁰ It is difficult to grasp in what sense Anaximander's ἄπειρον could be thought to be material or bodily in any normal sense. If it is indeed the *principle* of the all of the material elements, it seems that it could not itself be a material element lest it would be a principle of itself. One could argue that the ἄπειρον is some other sort of body, but it seems to be Anaximenes', not Anaximander's, great step backward to posit air as the fundamental element which is fundamentally no different than Thales' water. It is indeed odd that Aristotle considers Anaximander to be a materialist, but the difficulty of this classification for Aristotle is apparent when he says that some say that Anaximander's material is somewhere *between* air and water (cf. *Physics* I 187a12 and 189b1 ff. and possibly III.4 205a17). This is not a material in any normal sense known to the physicists of the era. Further, there is some difficulty in determining that it was after all Anaximander that Aristotle was actually referring to in this passage. It appears that it may have been the usually astute commentator Alexander (and later Themistius, Simplicius, Philoponus, and Asclepius; cf. Zeller 1881, 241) that attributed Aristotle's reference to Anaximander despite the telling division in *Physics* I.4 (187a12 ff.) where Aristotle divides off "those who make the substratum one, either one of the three or something else denser than fire and finer than air... [from] *others who say that the opposites are separated out from the one, as Anaximander says.*" Zeller comments that "the words of Aristotle were only referred to Anaximander because they seemed to apply to no other philosopher" (Zeller 1881, 214). Burnet (1920, 55) and Joachim (1999, 226)

The word ἄπειρον, however, admits of several possible meanings of which I have been employing a sense which means primarily ‘indeterminate’.³¹ It can also mean unlimited in time or spatial dimension or even number in which case the more common translation of ‘infinite’ would be apt. Doubtless, Anaximander’s fragment would allow that ἄπειρον could have any or all of these meanings. It is generally agreed that Anaximander thought of the ἄπειρον as ‘deathless’ or infinite in time. There is considerably less agreement as to whether or how Anaximander would have envisaged the cosmos as infinitely large or even infinite in number. If there were an infinite number of worlds, it is unclear that the word cosmos would retain its meaning (cf. Kahn 1960, 46-53 and 188-193).

Aristotle himself imputes to Anaximander the idea that the ἄπειρον implies infinite extension. Indeed, Aristotle’s treatment of Anaximander in the refutation of the view that there could be an infinite body (*Physics* III.4-7) treats his ἄπειρον as if it meant *primarily* infinite in extension. But again, there is no small difficulty in understanding how Anaximander could have understood his ἄπειρον as a body at all at least in the way Aristotle seems to understand him.

Anaximander is also reputed to be the first to write a book entitled Περί Φυσεως which is supposed to have covered the fundamentals of natural philosophy as well as topics in meteorology, astronomy, etc. Thus he begins the

carry the traditional view following Alexander’s testimony. Cf. Kirk 1970, 328 ff. for a discussion of the debate.

³¹ Kahn (1960, 194) rejects Nietzsche’s (2001, 32-37) construal of ἄπειρον as indefinite. KRS (1983, 109-111) in turn rejects Kahn’s construal of ἄπειρον as infinite. On the controversy, see translator’s commentary in Nietzsche 2001, 191-3.

tradition among the Greek natural philosophers who write treatises bearing the name Περὶ Φυσεως which were intended as comprehensive accounts of the natural world and its origins. He is also supposed to be the first to use the term ἀρχή in a technical sense though again is a great deal of debate as to whether or not this was a Peripatetic interpolation.³² The fact that almost all of his fundamental concepts would resurface in the history of natural science among the Greeks testifies to his importance in the genealogy of natural science leading to Aristotle: the unlimited, nature, cosmogony and the idea of cosmos, genesis and destruction, necessity, and time.

1.3 The Eleatic Response: Critique of Natural Philosophy

With the Eleatics we have the first critical reflections on the nascent tradition of natural science pioneered by the Milesians. This characteristic of critique (in a particularly Kantian sense) leads Jaap Mansfeld to claim that Parmenides is in fact the first genuine philosopher and not merely a practitioner of ‘science’.³³ Xenophanes appears to be the first thinker in the Greek tradition to be concerned with ‘epistemological’ questions concerning the justification of

³² The general consensus is that Simplicius’ testimony is accurate. For a discussion of the attribution and use of ἀρχή in Anaximander see KRS 1983, 108-111. Cf. also Heidel 1980, 215 ff. For an examination of the problems surrounding the attribution see G.S. Kirk 1970 and McDiarmid 1953, 90 and 96-98.

³³ Again, there may be some real distinction to be made here between philosophy and science, but perhaps this does not warrant such a strict division that Mansfeld proposes. After all, Parmenides and Xenophanes provide speculations concerning nature. The essential difference being that they demote such speculations to the status of opinion and deny in principle what the Milesians had assumed even if implicitly: namely that nature was in a knowable in a way more than by mere opinion.

claims that both natural philosophers and poets make about nature and the gods. Parmenides and his successors carry on this project to a point which threatens to paralyze the tradition of natural philosophy. Yet strangely, Parmenides offers speculations about the character of nature despite the explicit denial that these speculations could constitute genuine knowledge.³⁴ This brings to the surface a further difficulty concerning why, given that he recognizes that Parmenides has opinions pertaining to nature, Aristotle does not consider him among those he calls φυσικοί or natural philosophers.³⁵ A correct understanding of the first difficulty should shed light on the second. For it is precisely the claim that the notion of critique differentiates the Eleatics from the Milesians that can assist us in understanding why Parmenides can offer speculations about nature even after his rigorous denial that such theories can attain to the rank of demonstrable

³⁴ There is considerably less evidence about the content of Xenophanes' theories of nature than there is of Parmenides'. This leads some commentators to believe that he did not take this aspect of his research seriously or that his theses on nature did not constitute a coherent whole but were rather "isolated observations and conjectures, sometimes pregnant and suggestive, but sometimes of a rudimentary and child-like kind" (Zeller 1881, 567). If however, we understand Xenophanes as a figure between Milesian natural science and its Eleatic criticism, we take the minimal risk of giving the benefit of the doubt that he was serious enough about his investigations into nature to have at least made an attempt at coherence.

³⁵ At least he does not do so in *Physics* I.2-3 where he develops an argument defending the project of natural philosophy against Eleatic monism (even though in *Physics* I.5 188a20 Aristotle imputes to Parmenides a thesis which would seem to place him among the φυσικοί). In the *Metaphysics*, however, he speaks of Parmenides as in some loose sense a physicist distinguishing him from Xenophanes and Melissus (986b9 ff.). The question as to what Aristotle's criteria for disqualifying each of the Eleatics from the rank of φυσικοί is difficult, but preliminarily we can say that he does so on the grounds of an epistemological distinction involving the character of the criterion by which a legitimate claim to knowledge can be determined. Even though some of the Eleatics espouse views about nature, they qualify them immediately as mere opinions. Aristotle's disqualification of them as φυσικοί is made on the grounds that they preempt any claims to knowledge for their physical opinions by taking seriously the consequences of their monism.

truth. Further, the notion of critique also allows us to understand why Aristotle, while recognizing the fact that Parmenides had some physical theories, denied him the name φυσικός, namely on the grounds that Parmenides' himself would not have considered these theories to constitute genuine knowledge but rather represent only the best possible *opinions* about nature. We will see that all of this rests on an epistemological commitment which is first articulated by Parmenides, which is made famous in Plato's work, and which is inherited by Aristotle. That is, namely, the commitment which rests on marking a fundamental distinction between knowledge and opinion.

The standard reading of Parmenides' poem is that he presents a devastating refutation of any discourse that would talk about anything except motionless and solitary Being. Parmenides' "deduction," as it is often called, demonstrates that only Being itself can be the object of knowledge: "It [Being] must be what is there for speaking and thinking of; for [it] is there to be, Whereas nothing is not; that is what I bid you consider" (1991, fr. 6 1-2). As is well known, the extant fragments of the poem are divided into three parts: a proem in which Parmenides describes his descent to the place of a goddess and describes two paths of inquiry which correspond to the two parts of the poem, the Way of Truth which is concerned with wholly immutable Being, and the Way of Opinion which he is warned to steer clear of. It is in this latter that the goddess offers the best possible cosmological account attainable by mere mortals. The classic difficulty is that the Way of Opinion is presumably subject to the very critique that Parmenides' goddess put forward in the Way of Truth, i.e. that any speech about the world subject to change is rife with false claims about Being insofar as it

confuses what really is with what-is-not and therefore speaks of non-being implicitly.

Traditionally, the great struggle has been to resolve the tension between the last two parts of the poem. And there is a real puzzle here: if Parmenides really banishes discourses that concern the composition and origin of the world of motion on the grounds that they implicitly invoke the self-contradictory idea of non-being, why would he turn around and give such an account of nature the cosmos himself? How are we to take these accounts seriously after such a devastating critique? There is a sense in which the cosmology that Parmenides' goddess gives may in fact be the best possible as the poem claims, but then only a divinity would be able to judge the relative worth of such an account. If this is the case we are in no better position with regard to knowledge of the world of change than we were with the poets.

On the other hand, it does seem rash to jettison the Parmenidean cosmology altogether as an indulgence in absolute fiction which is perhaps the easiest solution and the common habit of many commentators. Parmenides never indicates that the world that the cosmology describes is a world of "illusion" or that all accounts of it are simply false. It is not the 'Way of Truth' and the 'Way of Falsehood' that he distinguishes. The subject of the cosmology is rather the subject of the *opinions* of mankind.³⁶ This distinction has strong enough consequences of its own. For once theories of nature and the cosmos are

³⁶ Gadamer makes the very interesting point seemingly unnoticed by the majority of commentators that it is opinions in the plural that pertain to the Way of Opinion while there is only one truth about Being in the Way of Truth (Gadamer 2001, 98).

confined to the domain of opinion, the question becomes one of deciding the relative merit of the various theories and on what grounds we may legitimately do so.

The fact that the claim that the cosmology in the poem is the “best possible” is put forth by the goddess who illustrates the cosmology indicates that it is perhaps only on the grounds of an appeal to the divine that this superlative claim can be made. Of course, the Goddess narrates and thus appears to attest to the truth of both the Way of Truth as well as the Way of Opinion. However, the claims about the immutability of Being made in the way of Truth are not presented as if there are other options. That is, once one is steered onto the right path, there are no competing ideas about the nature of Being. There is only one truth about the one being. On the other hand, there is a multiplicity of competing theories about nature which one must choose between if one embarks on the Way of Opinion. Along this path, the only way to assure that we are not misled by faulty yet compelling opinions is to rely on the guidance of someone with better judgment. In this case, this role is filled by Parmenides’ goddess.

The Parmenidean critique of the Milesian science is meant to show the limits of the human capacity to understand nature. This function of the arguments in the Way of Truth is complemented by the presence of Parmenides’ use of the figure of the Goddess. Parmenides’ appeal to the authority of the goddess reinforces the idea that the unaided human mind may not be capable of judging the truth of things especially when what is being considered is changing nature. It is not necessary to take the role of the Goddess as literally a source of

divine revelation for Parmenides, but rather the figure of the Goddess may serve as a propaedeutic device within the context of the poem.

Similar conclusions are available from a consideration of Xenophanes. Even if it is supposed that Xenophanes' critique is leveled primarily against anthropomorphizing poets (which is a common view among commentators), the substance of the criticism also holds against any human claim to truth including the Milesian cosmologies:

No man knows, or will ever know, the truth about the Gods *and about everything I speak of*; for even if one chanced to say the complete truth, yet one knows it not; but seeming is wrought over all things [*or fancy is wrought in the case of all men*]” (KRS 179, Fr. 34, italics mine)

The inclusion of “everything I speak of” in addition to the Gods allows the possibility that Xenophanes' criticism is not limited to the poets but may just as well apply to opinions about nature. KRS remarks that Deichgraber “thought that [this fragment] was intended as the proemium of the physical doctrine, not of constructive theology.” This seems plausible though Schofield disagrees (KRS 180). Cherniss goes so far as to banish Xenophanes from the philosophical tradition completely characterizing him “as a poet and a rhapsode, who has become a figure in the history of Greek philosophy by mistake” on the grounds that his theology and “sporadic” remarks concerning natural phenomena and “were made only *for the sake of denying* both the mythological and the subtly scientific explanations of them” (Cherniss 1970, 18, italics mine). However, what disqualifies Xenophanes for Cherniss is precisely what would qualify Xenophanes as a philosopher in the critical tradition. Namely, Xenophanes' negative remarks concerning mythological and sophisticated explanations indicate a

thoughtfulness about what constitutes real knowledge of things and thus places him in the company of the Parmenides as a critical philosopher.

But it is not so cut and dry with Xenophanes either for we have a similar problem as we had with Parmenides. Xenophanes as well may have had theories about the physical world. Again, the difficulty occurs when we consider that there is (perhaps more explicitly in Parmenides) a disavowal of the possibility of genuine knowledge about certain subjects accompanied by a discourse on those very things which seemed to be repudiated. Why offer an opinion about the origins and composition of the world if you have relegated it in advance to domain of opinions for which there is no way to gauge the relative truth except by an appeal to divine authority? There is the further interesting point that distinguishes Xenophanes from Parmenides: nowhere in the fragments of Xenophanes do we have an indication that he made some claim to revelation or inspiration by any sort of muse or divinity. It is generally held that Xenophanes repudiated these types of claims altogether. He was in this sense more radical than Parmenides in that his critique of the poets, beliefs in anthropomorphic Gods, and natural science were not made on the grounds or with the help of divine authority.³⁷

Aristotle treats Melissus as belonging to the same category of thinking not only for the obvious fact that they share monistic views, but also on the grounds that this results in their sharing similar epistemological views with regard to

³⁷ On the relation of Xenophanes' skepticism to his attack on divination see Leshner 1983, 20-41. "Later writers tell us that Xenophanes coupled the distinction between knowledge and mere belief with a contrast between divine and human capacities: god knows the truth, but belief is allotted to men" (Leshner 1983, 22).

nature. However, Melissus' brand of monism is peculiar in that, unlike Parmenides at least, he holds that the principle of monism should apply to nature itself. In the *Metaphysics*, Aristotle distinguishes Parmenides, Xenophanes, and Melissus on the following grounds:

Parmenides seems to take hold of is one according to reason [κατὰ τὸν λόγον], Melissus of what is one in material [κατὰ τὴν ὕλην] (on account of which one says that it is finite, the other infinite). But Xenophanes, the first of these who made things one (for Parmenides is said to have become a student of his) made nothing clear, nor does he seem to have made contact with nature in either of these two ways, but gazing off into the whole heaven, he said that divinity was one. (*Metaphysics* 986b19-24)

Contrary to ordinary experience these thinkers hold in common that what really is is one and motionless. Interestingly, Parmenides is the only one of the three that Aristotle thinks even has a shot at being considered a natural philosopher despite the fact that Melissus is supposed to be the one who says that the one Being is a material principle (*Metaphysics* 986b20). What disqualifies Melissus from being associated those “writers about nature who set down being as one but generate things out of the one as from material” (i.e. the material monists such as Thales) is that Melissus denies that the one material Being is in *any* way changeable and much less can anything be generated from it as the material monists believe (986b16). Melissus seems to have thought that because being is everywhere and infinite that it could have no place to move to. However, as Aristotle points out in his arguments against void in the *Physics*, Melissus failed to realize that even if being is everywhere with nowhere to move into, there can still be motion within itself, “for even what is full admits of alteration” (*Physics* IV.7 214a28 ff.).

Melissus appears to be more radical in his denial of multiplicity and motion than even Parmenides in that he makes the one Being infinite in extension in order to prevent the thought that Being would be surrounded by empty space into which it might be able to move. We can see that if Parmenides is understood by way of Melissus' interpretation of the one Being as material, there would indeed be some implicit fault in Parmenides' reasoning that Being is one, "well-rounded," and spatially finite. Despite Aristotle's characterization, some commentators think Parmenides held that in some sense the whole of being was, if not corporeal, extended in a literal sense.³⁸ This allows at least one avenue of reconciliation of the way of Truth with the cosmology in the Way of Opinion. However, this strategy is based on a fundamental misconstrual of Parmenides and an ultimately disastrous conflation of Parmenides and Melissus. This mistake can be avoided if one takes notice of the fact that, at least in Aristotle's reading, Melissus identifies the physical with the nature of the One while Parmenides can consider them separately allowing that even though there may be truth about Being alone, this does not mean we cannot speak without some sense about that which changes and associates with non-being. Aristotle's reports in *Metaphysics* I and *Physics* I make clear that Parmenides' physical speculations remain in some way separate from his doctrine of the one immutable being unlike Melissus for whom the physical and the metaphysical appear to be inseparable.

³⁸ Burnet exemplifies the most extreme of this interpretation: "What is is, therefore a finite, spherical, motionless, continuous plenum, and there is nothing beyond it. [...] Such is the conclusion to which the view of the real as a single *body* inevitably leads, and there is no escape from it. The 'matter' of our physical text-books is just the real of Parmenides" (Burnet 1932, 68).

A careful reading of Aristotle's report in *Metaphysics* I can assist us in avoiding this unwanted consequence. Although the monism of Parmenides and Melissus are often treated as equivalent it is important to distinguish them in order that we see clearly how Aristotle understands the challenge of Parmenides' critique of natural science. If Melissus conflates the metaphysical and the physical, the Eleatic critique of claims to knowledge about the world of motion becomes even more severe than it was with Parmenides. For if the one Being is infinite because it is material, even the things we experience as material and in motion will not only be banished from the domain of genuine knowledge, but the motion we experience must be considered a complete hallucination and not merely epistemologically unintelligible. Not only are we restricted from being able to judge the relative truth of a given set of opinions about the changing natural world (as was the mild outcome of the Parmenidean critique), but now our experience as such is deceptive. Because for Melissus the material world is equated with motionless being and because we experience the world as in motion as well as the subject of our opinions, our opinions are in a much more radical way simply false and illusory. Not merely deceptive in their claims to a higher truth or to greater authority than other such claims but simply false in that they correspond only to that hallucination in which there appears to be motion where in reality there is only motionlessness. For Melissus, but not Parmenides, the world we experience and the statements we make about it are hopelessly unintelligible.

Aristotle, however, does not take Melissus to be the serious threat. Melissus' critique is absurd to any half-way thoughtful person. It is rather

Parmenides that he must contend with. And thus he need not contend with Parmenides on the ground that he makes the world of appearance simply nonsense and illusion (this is Melissus' position, not Parmenides'), but on the grounds that *Parmenides would prohibit Aristotle from making the claim to genuine knowledge for his natural philosophy*. Thus in the beginning of the *Physics*, the intention is not simply to establish *that* the object of the proposed science really is something (properly this would be the refutation of Melissus only), but also to establish that there can be more than mere opinion about nature. The latter would constitute the proper refutation of Parmenides. This we will see is the goal of the first book of the *Physics* which in seeking to establish *that* there are principles involved in the study of nature, supplies a refutation of Eleatic skepticism concerning the knowability of nature.

However, Aristotle's treatment of Parmenides is complex. For even though Aristotle rejects him as deserving the name φυσικός, he credits Parmenides with at least some sort of insight into nature insofar as he grants some importance to "appearances" and the perspective of "perception" which in turn led Parmenides to posit "two causes and two sources, a hot one and a cold one, as though speaking of something like fire and earth, and of these he ranks the hot one under being and the other of non-being" (986b28, cf. also *Physics* I.5). How then do we account for Aristotle's varying treatment of Parmenides? If Aristotle grants that Parmenides had *opinions* about nature while denying the possibility of *knowledge* about nature, his exclusion of Parmenides from the group called φυσικός makes sense on the grounds that the φυσικός claim to have *knowledge* about nature (again in contra-position to the poets who claim that

their *opinions* are authorized by a divine source and in some sense are more worthy opinions). And despite the fact that Aristotle refutes even those of his predecessors who make a claim to truth, this would not preclude the fact that Aristotle thought that they were attempting to speak the truth about nature and thought this was in fact possible.

Conclusion

What we have seen in the relationship between the Milesians, who offer the first attempts to understand nature, and the Eleatics, who deny in principle that such knowledge is possible, is the genesis of an epistemological tension between the reality of changing nature and the ideal of human knowledge. With the Eleatics, it is the paradoxes that arise with the examination of the idea of change that yield the prohibition of the claim to knowledge regarding nature. It is these difficulties to which Aristotle is compelled to reply in the opening chapters of his *Physics*. Whether he replies adequately will have to be seen in subsequent chapters, but we can already see the issue: If Aristotle intends to put forward an account of nature that is not meant to be a “likely story” or even a best possible opinion, he must overcome the Parmenidean injunction not to speak about non-being in a way that renders the concept of motion and its application to nature intelligible.

Overcoming the Eleatic obstacles to the study of nature is at the same time a rehabilitation of the earlier Milesian attempts to come to grips with nature. The crucial difference is that Aristotle prioritizes a notion of form over the appeal to material causes which is characteristic of the Milesians. And it is precisely

change of form in its most proper sense, change in substance, which will prove to be of greatest difficulty in establishing the study of nature as a rigorous science. In terms of the characterizations and sets of problems outlined above, Aristotle's project in the initial chapters of the *Physics* are formulated as a direct response to the Milesian and Eleatic traditions.

Aristotle is not the first to formulate such a response. Democritus' and Leucippus' atomism, Anaxagoras' panspermism, and Empedocles' doctrine of the elements can all be read as responses to the Eleatic critique which in some sense seek to rehabilitate the Milesian project. In *Physics* I, Aristotle shows to what extent these attempts are unsuccessful in accounting for all the phenomena of change and offers his own solutions to the two-fold paradox offered by Parmenides. We will see in the next chapter that Aristotle is the first (though following the lead of Plato) to really square off with Parmenides and attempt to actually overcome him.³⁹

³⁹ Plato as well might be thought of in the same light as Aristotle here, especially in the *Sophist*. It remains unclear whether Plato actually succeeds in overcoming Parmenides or if he is ultimately also bound to accept the Parmenidean conclusion as to what humans can have genuine knowledge of. It is at least common Platonic orthodoxy that Plato is like Parmenides in that they both deny knowledge of the sensible world. But whether Plato thinks that knowledge of the Forms is possible for the unaided human intellect is another much more difficult question.

Chapter 2

The Argument of *Physics* I: Legitimizing the Science of Nature

In the previous chapter I provided a sketch of the context of presocratic philosophy out of which Aristotelian physics was born. This chapter shows how the arguments of *Physics* I respond to this presocratic context in its attempt to legitimate the study of nature. I argue that the primary goal of book one is to demonstrate that the study of nature can yield genuine knowledge rather than mere opinion and that the demonstration responds to the Eleatic challenge to the intelligibility of nature. My analysis discloses the polemical nature of Aristotle's discourse, and that it is not always grounded in solid argument. Because Aristotle recognizes the difficulty of the epistemological problems the Eleatics pose, he finds it necessary to supplement his arguments with rhetorical strategies that obfuscate important deficiencies in his own defense of the science of nature. This becomes most apparent in his explicit refutation of the views of Parmenides and Melissus in I.2-3 and in the interpretation of Aristotle's account of change in I.7-8.

We must proceed with a critical attitude (perhaps even a suspension of disbelief, depending on how convinced we are of the validity of natural science) in order to understand the force and the importance of the arguments and their order as Aristotle presents them in *Physics* I. If we assume in advance the legitimacy of natural science, we risk missing what might provoke genuine concern for what is at stake for Aristotle here.

In the first book of the *Physics*, Aristotle seeks to accomplish three interrelated goals: to establish the legitimacy of natural science, to delimit the field of inquiry of that science, and to begin to give a rational account of the phenomenon of change. The argument is presented in three stages. He engages the views of his predecessors in a dialectical and critical way (184b23). Second, he formulates the problem of understanding change by deriving a generalized account of change from the common views of his predecessors. This in turn generates a set of difficulties which must be solved if there is to be a coherent theory of change. Third, he establishes a preliminary account of the phenomenon of coming-to-be which attempts to resolve these difficulties.

The opening lines of the *Physics* lay out the guidelines for understanding and knowledge (τὸ εἰδέναι καὶ τὸ ἐπίστασθαι, 184a10) of things that are ruled by principles, that is, we should move from what is better known to us to what is better known 'by nature'. This strategy is followed throughout the course of the argument of *Physics* I. *Physics* I.2-6 reviews the doctrines of the predecessors. This review can be further divided into discussions of those who, in Aristotle's estimation, were not primarily concerned with the study of nature on philosophical grounds (Parmenides and Melissus) in chapters two and three and

those Aristotle identifies as φυσικοί or natural scientists in chapters four through six.⁴⁰

The last three chapters of book one constitute Aristotle's own attempt at an explanation of the phenomenon of change or coming-to-be and the putting to rest of the Eleatic injunction to the study of nature. This explanation both corrects the theories of his predecessors and, by doing so, means to overcome the Eleatic injunction to the study of nature (I.8 191a23 ff.). That this is the intention of these arguments is for the most part a matter of consensus; the interpretation and estimation of the success of these arguments is widely disputed. As Aristotle presents them, the arguments in these chapters are at best terse and ambiguous and at worst abstruse and equivocal. The abundance of scholarship on I.7 testifies to this as does the paucity of scholarship on I.8, a chapter which is often glossed and rarely given the effort of a critical interpretation.⁴¹ I will attempt to remedy this by offering an interpretation which demonstrates that it is as much

⁴⁰ In fact it is only chapter four which provides a direct refutation of a doctrine of a thinker Aristotle considers one of the φυσικοί (i.e. Anaxagoras). For while chapters five and six mention physical theories which are readily associated with certain presocratic physicists, the discussion here is drawn in quite general terms and not meant to provide specific refutations but to extract positive contributions to the understanding of change by bringing together commonalities from diverse thinkers.

There are also, more or less indirect (they are not explicitly named), references to Plato and the Academy in these chapters though it is unclear whether we should consider Plato himself in the category of φυσικοί. It may be the case that although he has a detailed account of the natural world, in the *Timeaus* for example, he may not consider the natural world and the beings in it as proper objects of genuine knowledge instead thinking that all that is possible is to provide "likely stories." Compare also the disparaging remarks in the *Phaedrus* made by Socrates at 230d ff. concerning his little interest in the phenomenon of nature. Gadamer believes that the whole of the criticisms Aristotle launches against his predecessors are really meant to be addressed to the Academy (Gadamer 2001, 75-76). Cf. Nussbaum (1982, 269-271) on Aristotle's epistemological association of Plato with Parmenides.

⁴¹ The significant exception is Loux (1992).

Aristotle's task to bring to light the difficulties and paradoxes of motion as it is to resolve the impasses of his predecessors. Aristotle does of course offer a way out, but this resolution leads to even deeper questions about the nature of change than that which it was meant to answer. The stakes are very high here. For if we find that Aristotle's solution to the paradoxes of change actually raises more difficulties than it alleviates, then the force of the argument which is meant to legitimate his natural science diminishes and perhaps even becomes suspect.

2.1 Approaching Nature

Aristotle begins the *Physics* with the claim that “in all pursuits in which there are sources or causes or elements [ἀρχαὶ ἢ αἰτίαι ἢ στοιχεῖα], it is by way of our acquaintance with these that knowing and understanding come to us” (184a10).⁴² If only by exclusion, Aristotle implies that there are investigations the subject matter of which does not involve principles or causes or elements.⁴³ He

⁴² All translations, unless otherwise indicated, are taken from Joe Sachs' translation of the *Physics* (Sachs 1995). Where I have supplied my own translations or modifications, I have done so using Ross's *Oxford Classical Text* as a source (Ross 1936).

⁴³ Aristotle's investigations that may be classified as ἱστορία are of this sort. Consider the place of the *History of Animals* in relation to a science of causes in *Parts of Animals* and *Generation of Animals*. *History of Animals* collects observations about particular animals with very little devoted to accounts in terms of causes, it is the work of *Parts of Animals* and *Generation of Animals* to investigate the principles and causes that govern the phenomena. On this distinction see Lennox (2001, 46-8 and 51-3; and 1987, 92 and 97). A helpful illustration of the difference can be drawn from the *Gorgias*. Here Socrates famously shows that rhetoric is not an art (τέχνη) but a knack (ἐμπειρία). If rhetoric is merely routine it may not admit of principles which account for its effectiveness. Cf. 463b-466a and especially 465a: “And I assert that it [rhetoric] is not art but experience, because it has no reasoned account.” However, consider in contrast Aristotle's justification of rhetoric as an art in *Rhetoric* I.1. Also consider the

thus gives us an indication in the very opening of the treatise that he will have to do some work to establish that physics is a field of study among the ones that do admit of explanatory principles. That is, in the opening lines Aristotle tells us that he must begin by convincing us *that* there are principles in the inquiry into nature before the claim can be made that nature can be known and understood.⁴⁴

It is not so much that Aristotle needs to convince anyone that there is such a thing as motion or change, but rather what he needs to establish is that there are *principles* underlying motion and change which make it intelligible. To establish that there is change one may simply appeal to our ordinary experience, the common perception that some things are in motion. Even the Eleatics who deny the intelligibility of motion do not claim that no one experiences motion. Aristotle asks us to assume at least minimally that “things that are by nature, either all or some of them, are in motion, which is obvious from examples [ἐπαγογῆς⁴⁵]” (185a14). It is apparent in perception that some things change

characterization of an art in *Metaphysics* I.1 as something which, because it admits of principles, can be taught.

⁴⁴ Consider the last lines of *Physics* I: “*That, then, there are starting points* [ἀρχή] and what they are, and how many in number, let it have been marked out in this way for us” (I.9 192b2). Compare also *Posterior Analytics* I.1-2 for the importance in any inquiry of establishing *that* there is a subject to be investigated.

⁴⁵ Aristotle’s method is not necessarily “inductive” in the modern sense that we begin with perceptual experience and extract universals which develop into understanding (cf. Bolton 1991). This was the traditionally dominant interpretation of Aristotle’s scientific method until the last quarter of the twentieth century. G.E.L. Owen’s influential article “*Tithenai ta phenomena*” published in 1961 (reprinted and cited as Owen 1975) opened the door to interpretations of Aristotle’s starting points and methods of inquiry free from the imposition of modern empirical prejudices of what constitutes good science (Cf. G.E.L. Owen 1975). Namely that for Aristotle what can count as starting points for inquiry into any subject can include ἔνδοξα, opinions of the wise and what is generally accepted (cf. *Topics* 100b12 and 104a8 ff.) in addition to experience and perception. This means that the phenomena which lie at the beginning of scientific investigation are

locations, characteristics, and even change into other things and we speak this way without trouble about it. So he is justified in supposing that reasonable people can accept that at least some things in nature are in motion.

Saying that there are intelligible principles underlying our experience of change is a bolder claim, and it is precisely this that is not yet evident to us and which Aristotle is compelled to establish.⁴⁶ Aristotle is asking a very radical question: *is nature inherently intelligible* and how can we show that this is so if it is the case? Timaeus in Plato's dialogue of the same name establishes principles of nature in a similar vein but with the important caveat that the account he gives

not restricted to what can be obtained only through the senses. Martha Nussbaum radicalizes Owen's point claiming that, "there is, in fact, no case for crediting Aristotle with anything like the Baconian picture of science based on theory-neutral observation" (Nussbaum 1982, 274). The consequence of Nussbaum's view (in her own words) is that natural science becomes a matter of "saving the phenomena" where this phrase means only preserving the sense of the *ἐνδοξα* by means of investigation (cf. Nussbaum 1982, 274, 276-7, and 291). By focusing on those places where Aristotle draws his evidence from common opinion, testimony of experts, and from linguistic usage, Owen and Nussbaum are able to show that Aristotle did not restrict what he considered to be legitimate evidence to sensory data. But however liberating these interpretations are, they also risk approaching the extreme position of understanding Aristotle as operating on a purely linguistic level such as we find in Wieland: "The task of inquiry is to raise to an explicit level and to encapsulate in conceptual terms this implicit knowledge about those linguistic structures which are initially far too obvious for us to have objective knowledge of them" (Wieland 1975, 133). Both the radically inductive and linguistic positions miss the mark in their extremity. In practice, Aristotle employs both inductive and linguistic analysis as can be seen throughout the *Physics*. An exemplary instance of his using both can be found of his account of change in I.7.

⁴⁶ That there is nature is "self-evident", or that Aristotle thought so, may be inferred from *Physics* II.1 though even there one might question his level of his commitment. That nature is governed by principles is however part of the question at hand here as can be seen in his discussion of Parmenides whose theories do not belong to the study of nature (184b25 ff.) and who presumably, owing to the belief that nature or the movable as such is unknowable in the strictest sense, does not believe there are principles of nature. We should not yet assume that Aristotle takes for granted that nature is governed by principles but that this is part of what is to be established in book one. The extent of what he assumes at this early stage is that there are some things in motion (185a12). At this basic level, even Parmenides was compelled by experience to admit some existence to plurality and motion (*Metaphysics* I.5 986b27 ff.).

should only be taken as a “likely story” (*Timaeus* 29d). Aristotle would like to remove this caveat.

The “natural way” to proceed, Aristotle tells us, is to move from “what is more familiar and clearer to us to what is clearer and better known by nature” (184a16) which means to move “from what is less clear by nature but clearer to us to what is clearer or better known by nature” (184a19). The investigation to establish what the principles of nature are, and even if there even are any, proceeds from our familiar and naïve understanding of change to the principles that govern change in nature. These are at first hidden from us, latent in our everyday talk and ordinary experience of the world to the extent that Aristotle can ask us to inquire whether they even exist.

This progression of the inquiry into nature, Aristotle says, follows “from what is general to what is particular” and begins with perception for “it is the whole that is better known by perceiving, and what is general is a kind of whole since it embraces many things as though they were parts” (184a25). Aristotle illustrates this with an analogy from language. Names “in relation to their meanings” exhibit the same relation of the general and confused to the particular and better known: “for a name too signifies some whole indistinctly, such as circle, but the definition takes it apart into particulars” (184b1).⁴⁷ These lines foreshadow the progress of the argument of book one.

⁴⁷ This section of text has been a source of great difficulty for commentators in that Aristotle seems to reverse his usage of universal and particular in relation to perception and thinking when compared with other passages in the corpus. The most striking of these is *Post Analytics* I.2: “Things are prior in two ways; for it is not the same to be prior by nature and prior in relation to us, nor to be more knowable and more knowable to us. I call prior and more knowable in relation to us items which are nearer to perception, prior and more knowable items which are further away. What is most

As Aristotle typically does, he prefaces his arguments with an examination of the doctrines of his predecessors. These he often takes as confused anticipations of his own developed theories. In book one of the *Physics*, the central theme concerns establishing whether or not there are principles governing change and if so how many they might be. The review of the predecessors' views about change shows how they articulated primitive versions of the three principles Aristotle employs in his own explanation of change. For example, he thinks that some of the presocratic physicists had varying notions of an "underlying thing" (or "the underlying body," τὸ [ὄν] σῶμα τὸ ὑποκείμενον, 187a12) and that they almost universally employed opposites in their accounts of change. Even though they may not ever explicitly name their principles "contraries" [ἐναντία], they all designate particular concrete oppositions as the principles of change: "For some set down as causes of coming into being the hot and the cold, others the wet and the dry, and others the odd and the even or strife and friendship" (188b34). Aristotle's advance is the generalization of the various particular oppositions bringing out what was common and necessary in the observations of his predecessors.⁴⁸

universal is furthest away, and the particulars are nearest" (71b31-72a5, Barnes translation). Compare the very similar remarks in the *Topics* VI.4 141b3 ff. and *De Anima* 417b2. For a compelling account of how to resolve the problem see Heidegger's lectures on Plato's *Sophist* (Heidegger 1997, 57-62). For a recent solution which does not employ chronological or phenomenological interpretation, see Angioni (2001). Also, see Bolton (1991, 2-4) who ties the problem to the famous passages on how knowledge arises in *Posterior Analytics* II.19.

⁴⁸ Aristotle is infamous for his attitude towards the views of his predecessors in this regard especially in the first book of the *Metaphysics* where he claims that the presocratics were all in one way or another aiming to articulate his own causes (see especially I.7 988a19 ff.). Aristotle could be accused of the same thing in book one of the *Physics* especially when he imputes a doctrine of contraries to his predecessors as if they

What is not clear yet from what we see and what we say is *what are* the principles that underlie what we perceive and speaking about. So the investigation must proceed from what is clearer to us (that some things change) to what makes the phenomenon knowable, namely to the principles of the phenomenon which are more knowable in their own right. We move from our general and confused (συγκεχυμένα, 184a22) understanding of “coming-to-be”, for which we have a name and some idea, to an account or definition which breaks up the whole into principles which are its parts or elements. This is especially apparent in chapter seven, the culmination of the investigation into principles, where Aristotle seeks to make the general notion of coming-to-be intelligible by analyzing it into three principles.

Paradoxically, we both begin and end with ἀρχαί. As starting points, we have nowhere else to begin except from ἀρχαί understood either as how we speak about change or how we perceive it. But from ἀρχαί in this sense, we move to ἀρχαί in the more proper sense, namely, to the principles that underlie our experiences of change. As Wieland remarks with great emphasis “*The principles stand at the end, not at the beginning of the investigation*” (Wieland 1975, 135). But as he also reminds us, we do not begin from nothing: there is “not a path from not knowing to knowing, but a movement from one form of knowing to

were “compelled by the truth itself” (188b29). Cherniss’ indispensable work *Aristotle’s Criticism of Presocratic Philosophy* (Cherniss 1964) is in its relentless argument to expose Aristotle on this count. Even though his point is well taken, the major difficulty in supposing that Aristotle is sometimes simply wrong or misguided in his interpretations is that it supposes that somehow we can understand the presocratics better than Aristotle did. For Cherniss’ discussion of this problem see Cherniss (1964, ix-xiv).

another” (Wieland 1975, 129). The ἀρχαί from which we begin are the confused appearances of things as they are given to us at first. The ἀρχαί with which we end are those that underlie that initially confused experience of the world and allows us to grasp its coherence in a rational way. As Joe Sachs articulates the situation: “Chapter 1 is highly ironic; one can hardly do other than start with what comes first, but what is inherently first must be discovered last” (Aristotle 1991, 12n10).

2.2 The Eleatic Obstacle

Of the predecessors that Aristotle reviews in book one, only Parmenides and Melissus in Aristotle’s estimation have made no progress toward a scientific study of nature (185a1 ff.). This is in fact a strange claim despite the received opinion that the Eleatics ‘denied’ motion. For even though very little of their thought survives in writing, Parmenides at least does provide rather detailed and complex accounts of the cosmological, meteorological, biological, and otherwise ‘physical’ subjects.⁴⁹ Aristotle remarks in *Physics* I.5 that “even Parmenides makes the hot and the cold original beings, though he calls them fire and earth” which should indicate some minimal affinity between him and the φυσικοί.⁵⁰

Nonetheless, Aristotle emphatically excludes both Parmenides and Melissus from the class of those who study nature. The reason for this, as was

⁴⁹ Cf. Parmenides’ fragments 8, 10, 11, 12, 16 and 18 in Diels (1922).

⁵⁰ Compare the similar passage about Parmenides in *Metaphysics* I.5 986b26 ff. On the relation between the Eleatics and the Ionians with respect to a distinction between knowledge and opinion, see the previous chapter.

brought out in the previous chapter, is that while Aristotle recognizes that some of the Eleatics may offer some account of the changeable world, in principle they deny that this world is knowable in the most rigorous sense. In other words, when the Eleatics say things about nature, they do so with the caveat that what is said can at best attain to the rank of opinion. Aristotle's imperative is clear. He must refute this view which rejects the genuine intelligibility of change if he is to legitimate his claim that the study of nature is a science.

Aristotle masks the importance of this task when he coyly capitulates to a discussion of the Eleatics:

But even though they do not speak about nature, they incidentally speak [συμβαίνει λέγειν] of things that are impassable for the study of nature. It is perhaps just as well to discuss them a little bit, for the examination is a philosophic one. (185a17)

The Eleatics did not just *happen* to speak about the impassables in the study of nature; there are rather good grounds to think that they were responding precisely to Ionian science and its (implicit) claims to knowledge. Second, it is not merely a "little bit" of book one that is occupied with a discussion of the Eleatics. The portions of chapters two and three which discuss them constitute four full Bekker pages, almost a quarter of book one. The entirety of chapter eight (another full Bekker page) is devoted to unraveling the ἀπορία of the apparent unintelligibility of coming to be from what-is-not which gave rise to Eleatic monism (191a25 ff.).

Further, key points of the discussion of the φυσικοί are premised by a reference to Eleatic difficulties. For example, the introduction of Anaxagoras' doctrine: "It is likely that Anaxagoras supposed things thus to be infinite because

he assumed the common opinion of those who study nature to be true, that nothing comes into being from what is not” (187a28). We find similar references in the discussion of the Academics in chapter nine: “For, first of all, they allow some thing to come into being out of what is not, on which point Parmenides speaks rightly” (192a1). It is clear that Aristotle is being more than a little ironic by downplaying the importance of the engagement with the Eleatic impasses to the science of nature.

Aristotle offers in chapters two and three what appear at first glance to be powerful refutations of both the positions of Parmenides and Melissus. He prefaces these arguments with an analogy which is meant to show us the manner in which one ought to deal with interlocutors that do not share one’s own starting points:

Now, to consider whether being is one and motionless is not to be examining nature. For just as it no longer belongs to the geometer to give an account to someone who rejects his starting points [ἀρχαί], but either to a different science or to one common to all knowledge, so is it with the one considering origins. (185a1)

It is not the business of one already engaged in a science to have to justify that science to someone who does not accept its basic principles. However, it is not as if there is no recourse by which to do so. One can appeal to another, higher science or to a method common to all knowledge. The obvious alternatives are either first philosophy or dialectic.⁵¹ However, it is not necessary to go beyond

⁵¹ Philoponus distinguishes these succinctly: “Dialectic differs from the first philosophy in that the latter constructs its proofs from self-evident premises and common notions, whereas dialectic works from established opinions” (Philoponus 2006, 47). Neither of these seem to me entirely adequate. First, Aristotle does not mention “first philosophy” by name even though the present topic of whether being is meant in one way is a topic that belongs to it. But, especially in the latter where we would have the further difficulty

the text of the *Physics* in order to establish the character of his treatment of the Eleatics, even if there is no technical term for it. There are at least a few hints that Aristotle disparages these opponents and may not treat them fairly.

Aristotle first gives us a sense of the range of problems that are appropriately dealt with by a science: “it is inappropriate to resolve all errors, but only as many as someone falsely concludes, demonstrating from first principles” (185a15). He gives more detail to his analogy from geometry to illustrate the point: “for instance, the squaring by means of portions belongs to the geometer to analyze, but that of Antiphon does not” (185a17). Antiphon thought that if one inscribed increasingly many sided polygons inside of a circle, one would eventually reach a polygon which was *coincident* with the circle. And because any polygon can be squared, one could square the circle which coincided with its polygon as well. Antiphon’s error cannot be corrected within geometry because it undermines principles on which Euclidean geometry is based, for one, the principle of continuity.⁵² It is not incidental that Antiphon was a well-known

in distinguishing the dialectic Aristotle uses when engaging the φυσικοί and that which he uses when refuting the Eleatics. Further, all of Aristotle’s works seems to be dialectical if this is meant to distinguish this method from syllogistic demonstration based on the geometrical model. For a discussion of the problem, see Spangler (1979, 95), Owen (1975, 125), and Ross (1936, 461). For a discussion of a way in which demonstrative argument can have a wider meaning than what is generally recognized as akin to geometrical reasoning, see Lennox (1987) and Gotthelf (1987).

⁵² Antiphon’s mistake lies in thinking that he had squared the circle by means of polygons. Hippocrates of Chios, on the other hand, found the solution to the quadrature of the lune and thought that by extension he had squared the circle. (Hippocrates presumably thought that lunes could compose a circle which is impossible.) The latter case is a mistake operating under the same principles (i.e. making the analogy between one curvilinear figure with another), while the former makes, as it were, an *a priori* mistake thinking that all shapes are in principle commensurable in area. Cf. Heath (1981, 221-3), Ross (1936, 463-5), and Sachs (1995, 47).

sophist,⁵³ and I would suggest that Aristotle is hinting that the best way to deal with a sophist is sophistically (or in more cordial terms, dialectically, though one still needs some way to distinguish the dialectical treatment Aristotle employs with the other φυσικοί from that which he uses against the Eleatics).

This is the way Aristotle in fact deals with Parmenides and Melissus twice calling them debaters or eristic types (185a9 and 186a10). He likens their conclusions to the absurdist positions of Heraclitus such as “being is one man” (185a9) and “being-good and being-bad” are the same (185b21) which amounts to the criticism that “their account would not be about the being-one of all things but about the being-nothing of all things” (185b24).⁵⁴ This is at least a rhetorical flourish by Aristotle if not a sophism in return for a sophism. Aristotle’s final attack is that both Parmenides and Melissus are incompetent logicians (186a6). Aristotle is hardly fair to his adversaries here, and this attack could easily be taken as an overt insult.⁵⁵ After all, Parmenides is considered to have been first of the great logicians and would have considered himself to be a master of argument if we are to take seriously the testimony of Plato in the *Parmenides* for example. Gershenson and Greenberg confirm this assessment of Aristotle’s treatment of the Parmenides and Melissus, “The critique of the Eleatics begins with a mounting crescendo of abuse, designed to destroy their reputation as

⁵³ See also *Physics* II.1 183a12 ff. for another reference to Antiphon which articulates the sophistic distinction between νόμος and φύσις.

⁵⁴ For a connection with this interpretation of the consequence of the Eleatic position and the Sophists, see Gorgias’ fragment 3 in Diels.

⁵⁵ Philoponus notes in several places in his commentary on chapters 2 and 3 of *Physics* I. One example: “Aristotle says this in the middle by way of mockery of them” (Philoponus 2006, 70).

philosophers. There is no argument here, only condemnation” (Gershenson and Greenberg 1962, 138).

After the initial abuse, Aristotle confronts the Eleatic objection to the intelligibility of change obliquely under the pretext of an investigation into the number of principles or realities that constitute the changeable world (184b14).⁵⁶ By forcing them into a discussion of how many principles there are and supposing they hold in common that there is only one, Aristotle is able to treat Parmenides and Melissus on his own terms. Aristotle’s preliminary and highly abbreviated refutation of the Eleatic position follows: “For it is not any longer an ἀρχή if it is one only and there is therefore only one thing, for the ἀρχή is *of* something or some things” (185a4). Once Aristotle compels the absent interlocutor to admit that there is a being on the one hand and a principle of a being on the other, it follows that there will be at least two things and not one.⁵⁷ It is crucial to his subsequent refutations of both Parmenides and Melissus that he challenges them in his own terms even when he poses as if he is arguing from premises that they are supposed to have accepted.⁵⁸

⁵⁶ In chapter eight Aristotle will argue directly and from grounds presumably within the domain of physical inquiry.

⁵⁷ This move puzzles Philoponus: “But if their discourse was not about the principles, why does Aristotle criticize these men on the grounds that they were mistakenly suggesting that the principle was one? My reply is that, even if they were not talking about the principles, nevertheless Aristotle criticizes the argument as if someone had been suggesting that the principle of physical things was one, because he wants to demolish such a theory” (Philoponus 2006, 43).

⁵⁸ *Pace* Gershenson and Greenberg (1962, 143 ff.) and Spangler (1979, 98). See also Charlton (1970, 53).

The arguments he offers against Parmenides and Melissus are therefore made from two positions. In chapter two, Aristotle argues overtly from his own doctrine that “things are said to be in many ways” (185a20) and in chapter three he takes up the Eleatics on their own terms in order to show their internal inconsistencies.⁵⁹ In both cases Aristotle attacks them on the grounds that “they reason invalidly from false premises” (186a6). Melissus’ premises are that “whatever comes to be has a beginning [ἀρχή]” and the false conversion that “whatever does not come to be has no beginning [ἀρχή]” (186a11 ff.). Because the whole is thought to have no beginning, it must not have come to be and hence must be a motionless One.⁶⁰ Aristotle questions the idea that if the whole is one that it follows that it must be motionless for some of the φυσικοί (Thales and Anaximenes for instance) believe the whole to be one in respect of its material

⁵⁹ First he argues by replacing the premises with premises of his own and second by showing the absurd consequences of their own premises. I follow Charlton’s division of the argument (Charlton 1970, 53) rather than Gershenston and Greenberg’s (1962). They are in agreement on the essential point that there are two separable lines of arguments against the Parmenidean position here differing only in where to make the division between the two in the text. They both agree that Aristotle argues first from his own position and then from terms granted by his opponents.

⁶⁰ Aristotle criticizes Melissus here for the faulty logic of reasoning that “if p then q, not-p, therefore not-q.” We should note that even though the conversion is illicit, this does not mean that the conclusion is false. In fact, the conclusion that whatever does not come into being does not have a beginning is self evident if we read this to say that *something that does not exist* and does not come into being does not have a beginning (for how could what does not exist have a beginning?). David Sedley defends Melissus on the grounds that he and his audience would have shared the implicit premise, not at all foreign to Ionian cosmology, that “the universe will be infinite unless it can be shown to be otherwise” (Sedley 1999, 126-7). Bolton (2005, 105) points out that the illicit conversion is Aristotle’s “*standard* objection to Melissus, he repeats it three times during his discussion of the fallacies in the *Sophistici Elenchi* (167b12-20, 168b35-40, 181a27-30).”

but to contain many different kinds of things which may change in relation to one another (186a20).

Parmenides' thesis in turn is shown to be inconsistent in that the supposition of the univocity of being does not imply the singularity of the whole (186a21 ff.). For,

the refutation is that it is false and in another that it does not follow: false in that he takes being to be meant simply when it is meant in more than one way, but not a necessary conclusion anyway because, supposing only white things were taken, white meaning one thing, nonetheless white things are many and not one. (186a26)

Aristotle claims that this argument does not follow even according to its own premises, but it may be objected that he has inserted a claim that Parmenides would not accept, namely, that “the white” is different from a white “thing” or “things” for either already admits a plurality. This strategy is also apparent in the intrusion into the argument of the particularly Aristotelian concept of the underlying thing which is separable from its predicate: “For the attribute is predicated of *some underlying thing* [καθ’ ὑποκειμένου], so that to which being is attributed would not be (since it is other than being), and there would therefore be something which is not” (186a34).

These refutations consist of arguments outside of the range of natural science, and, as we can see, they are in many ways sophistical. In the first set, Aristotle argues from his own assumption that being and one are meant in several ways (which his interlocutors would in all likelihood not accept). In the second, he argues from premises which his opponents accept in order to generate inconsistencies out of the premises themselves and show the flaws in their

reasoning. In both cases he does this by means of inserting a characteristically Aristotelian concept. Whether he does this in a way that is fair to his opponent is questionable. But he has prepared us for the possibility of an unjust treatment in his characterization of Parmenides and Melissus as practitioners of eristic debate and by comparing them with the sophist Antiphon. Whether or not we think of Aristotle's rhetorical assault on the Eleatics as in some way dishonest, one has to consider the possibility that there is perhaps no alternative means to confront them. Aristotle may have thought that the ends are important enough to justify the means in this case.

Aristotle returns in chapter eight to unravel the paradox that he says is at the root of the Eleatic monism (191a30 ff.). One wonders why, if we are meant to believe that the arguments of chapters two and three are definitive, Aristotle would feel the need to return in chapter eight to present an argument which would undermine the Eleatic position for a second time. If the means were available, would not the better strategy be to unravel the ἀπορία which generated the position which one wanted to refute than to refute the conclusions and leave the ἀπορία intact? Aristotle will attempt to do the former in chapter eight but this time within the register of arguments proper to physics.

Aristotle prepares us for this second refutation of the Eleatics in the intervening chapters. Here he highlights the points in the theories of his predecessors where they failed to overcome the Eleatic objection. Finally Aristotle offers an analysis of change which purportedly resolves the impasses of the Eleatics. This final argument culminates in what he claims is the "only" possible solution to the central Eleatic objection to the intelligibility of change

which none of the subsequent φυσικοί could overcome, namely, that nothing can come into being from what is not or from what is.

2.3 Examination of the Doctrines of the Φυσικοί

The second stage in the argument of *Physics* I is the review of the predecessors whom Aristotle considers to be genuine inquirers into nature, that is, those who already accept that nature is knowable in some way by means of principles. The point of the review beginning in I.4 and carried through I.6 is not only to correct what is wrong with previous theories but also to salvage whatever might be already correct in them. Aristotle begins by dividing the φυσικοί into two classes: those who make the underlying body one and account for the differentiation of things by means of the density and rarity of the material substrate and those who “make the one stuff already contain in it oppositions” (187a21 ff.). The bulk of the argument is against Anaxagoras who holds the most extreme position that the elements or principles are unlimited in number and mixed. The reason for the extended and detailed treatment that Anaxagoras receives in comparison to the other φυσικοί is that even though he is considered to be an inquirer into nature, his understanding of the principles of change threaten to undermine the legitimacy of natural inquiry as genuine knowledge. In Aristotle’s eyes, Anaxagoras risks leaving us in much the same position as the Eleatics had:

If the limitless as limitless is unknowable, the infinite in multitude or magnitude is unknowable as to how much it is, and the unlimited in form is unknowable as to what kind of thing it is. But since [for

Anaxagoras] the original beings are infinite both in multitude and in kind, it is impossible to know the things made of them [viz. natural beings]. For we assume we know a composite in this way: whenever we know how many things it is made and what they are. (187b9)

Making the number of principles infinite yields the same result as the Eleatic denial of the intelligibility of change. Aristotle is thus compelled to give a detailed refutation, this time though considerations proper to physics, in order to maintain that the objects of natural science are in a genuine sense knowable.⁶¹

Anaxagoras supposes unlimited principles probably, Aristotle claims, “because he assumed the common opinion of those who study nature to be true, that nothing comes into being from what is not” (187a28).⁶² So in order to avoid this consequence, Anaxagoras made generation a kind of alteration by means of a process of “coming together and dissolution” of infinite elements in different mixtures (187a30).

What motivates Anaxagoras’ thought is the same insight that motivated the Eleatic denial of the plurality of beings and the knowability of motion. However, instead of denying the possibility of understanding change, Anaxagoras

⁶¹ Arguably, Aristotle ought to offer similar refutations of the position of Democritus. At 203a18 Aristotle equates the positions of Anaxagoras and Democritus on the grounds that they both say that there are an infinite number of elements: “...but as many as make the elements finite, which Anaxagoras and Democritus do.” However, compare the more proximate passage concerning Democritus at 188a19 ff. where he is grouped with those who call the contraries principles on the grounds both that he posits the full and the void as well as position, shape, and arrangement which are “classes to which contraries belong.” In this latter sense Democritus would appear to have a finite number of principles.

⁶² This is a thesis which ultimately was only a *partial* concession to Parmenides in that they still allow what comes to be to come from what already is.

– and Empedocles’ doctrine of change is similar in this regard – seeks to work around the Eleatic difficulty rather than submit to it or to confront it head on:

If everything that comes into being must come either out of what is or what is not, and of these, the coming out of what is not is impossible (for about this opinion, all those who concern themselves with nature think alike), they regarded the remaining choice as following immediately by necessity, that coming into being is from what is already present all along. (187a34)

Thus Anaxagoras holds that in order for what-is to come to be from what-is all things must already be present in all things. In any of these mixtures we call the whole of it by whatever happens to predominate. All of the other things that we might call it if they predominated are nonetheless present in it imperceptibly. And through the gathering of these parts together by separating them out from the whole, we have it that what was something can come to be something else. The advantage of Anaxagoras’ theory is that it does away with non-being. He solves the problem of coming into being from what-is-not by supposing that there are only beings. By making them infinite however, Anaxagoras makes them unknowable to a finite being.

If nothing comes to be from what is not, what comes to be must have already been there, hidden by the small quantity present which “cannot be perceived by us because they are extremely tiny” (187a35 ff.). Aristotle refutes the basic claim that all things are mixed and that things come to be by being separated out and becoming preponderate by showing a number of fallacies that arise out of this compositional model.⁶³

⁶³ Aristotle’s refutation of Anaxagoras is the most detailed and sustained examination of a predecessor in *Physics* I. This fact alone at the very least indicates some level of importance. Aristotle must confront Anaxagoras because, like the Eleatics, he is a threat

Anaxagoras has not succeeded any more than the Eleatics had in making the phenomena of nature and change more knowable. In his attempt to explain how things can come to be, he has ended up claiming that what was intelligible to us from the beginning, our basic knowledge of what sort of a thing something is, can be explained by what is less intelligible (namely, an unlimited number of principles). Though similar in many ways, Empedocles at least fares better by

to the project of natural science, but to explore the specific arguments against him at this point would be too much of a digression. In outline, the analysis of Anaxagoras is divisible into five parts in the passage from 187b9-188a18:

An epistemological argument:

if the original beings are infinite, the composites which they constitute are unknowable to a finite being (187b9-13). It might be objected that this is not properly an argument for rejecting Anaxagoras' theory in that it seems to beg the question assuming in advance that the phenomena should be intelligible which is precisely what Aristotle wants to show. As an argument, it does, in a sense, beg the question, but it need not function to bear the weight of the entire refutation. Rather, it lets us know what is at stake in the four refutations that follow.

An argument from composition:

if part of a compound is capable of being as large or as small as we like, so then is the compound capable of being as large or as small as we like. But an animal or plant cannot be any size whatever; therefore there cannot be an infinite amount of any single element (187b13-22).

An argument from separation:

if everything is mixed with everything, one could pick out one element to separate out and by taking a definite amount, of say flesh, out of the compound repeatedly one would eventually exhaust the supply of flesh in the compound. Hence, there would be no flesh left in the compound and not everything would be mixed with everything (187b22-188a5).

An argument against Anaxagoras' "Mind":

"For attributes are inseparable. So if colors and states are mixed, if they were to be separated out there would be something white or healthy which was not anything else and did not belong to any underlying thing. So the intelligence [νοῦς] is absurd, since it seeks what is impossible, if indeed it wants to separate them; and this is to do the impossible both in the case of the how-much and in that of the of-what-kind, the former because there is no least magnitude and the latter because attributes are inseparable [from and underlying thing]" (188a5-13).

An argument against the coming to be of homogeneous things:

Anaxagoras takes it that what comes to be must come from what is already. Aristotle thinks that Anaxagoras is thus forced to conflate change of arrangement with substantial generation. For Anaxagoras "it is in the same manner as bricks come from a house and a house from bricks that water and air both are and come to be one another" (188a13-19).

making his principles limited (188a18) and hence at least leaves open the possibility that the phenomenon is comprehensible by a finite intellect.

2.4 Generalizing from the Predecessors

Aristotle ends his critical remarks of his predecessors (directed primarily at the Eleatics and Anaxagoras) by the beginning of chapter five and here begins to salvage what he can from previous theories. We need to be cautious to distinguish what Aristotle says in chapters five and six from what is properly his own account of the conditions of the intelligibility of change which properly begins in chapter seven.⁶⁴ In chapter five, Aristotle begins with a consideration of starting points or principles which in his estimation are common to all natural philosophers: “Everyone makes contraries the principles” (188a19). This, Aristotle tells us, has some reason to it (188a26) and what follows are arguments which to some extent justify the claim (cf. also 189a10).⁶⁵

⁶⁴ Pace Ross (1936, 487): “189a19: Aristotle begins here his positive account of the first principles.” The vast majority of commentators follow Ross. Charlton is more sensitive to the progression of the arguments from *Physics* I.4-8. See Charlton (1970, 67 ff.) for the view that what is properly Aristotle’s account begins only in chapter seven.

⁶⁵ For Aristotle, the sense of “contrary” (ἐναντίον) is more specific or refined than it would have been for his predecessors. Many of the presocratics may have thought of contraries as “stuffs”, not making a distinction between the contrary as an attribute and that in which it inheres. For example, the hot and the cold may have been thought of as fire and water or some other hot or cold stuffs (cf. Heidel 1980, 333-79). Aristotle alludes to this in chapter six with reference to Parmenides (188a20). Cf. Heidel (1980, 337 and 343) and Cherniss (1964, 50-1). For Aristotle, the sense of “contrary” (ἐναντίον) is more specific or refined than it would have been for his predecessors. But there is another sense in which Aristotle understands the notion of contraries, or more generally opposition (ἀντικειμένα). In *Categories* 10, Aristotle distinguishes four different kinds of oppositions (ἀντικειμένα): contraries (ἐναντία), contradictories (κατάφασις καὶ ἀποφασις), privations (στέρησις), and relations (τὰ πρὸς τι). It is contraries in the narrow sense that Aristotle wants to impute to his predecessors as principles and which

The discussion of contraries in chapter five divides into three parts: 1) an appeal to the authority of the predecessors who all, in one way or another, posit contraries as principles, 2) an appeal to reason or argument (λόγος) that would establish that contraries are in fact principles, and 3) a clarification as to the way in which those who posit contraries as principles differ by supposing different oppositions to be the more fundamental.

In the first part, Aristotle deals primarily with Democritus presumably because his atomism does not obviously fit the scheme of contrariety. Aristotle shows that even Democritus' doctrine implies the use of contraries in that the "full" (πληρὲς) and the "void" (κενόν) are contraries and even those attributes that characterize the relations of atoms (position, shape, arrangement) "are classes to which contraries belong: to position, up and down, before and behind, [etc.]" (188a25). Aristotle concludes by clarifying the reason, and hence also the criterion which validates the supposition of contraries as principles, why his predecessors called the contraries principles:

For the original beings must not be from one another nor from anything else, and all things must be from them, but this belongs to the first contraries: since they are first they are not from anything else, and since they are contraries they are not from one another. (188a28)

will carry through in his own view in chapter seven. There are important limits to the scope with which this analysis can be employed. As we will see, difficulties arise from the consideration of the fact that substantial beings do not properly have contraries (cf. 189a33). Aristotle's careful use of the more general term "oppositions" (ἀντικειμένα) when discussing the way in which compounds arise out of things that are only in some derivative sense contraries indicates some sensitivity to his own distinctions from the *Categories* (188b9 ff.).

It is at this point still unclear whether the predecessors were correct in what they named the “*first* contraries,” but the fact that they identified the contraries as principles receives Aristotle’s blessing. Aristotle will return to the question of “first contraries” later in the argument. At this point he assigns himself the more limited task of finding some concept general enough to encompass all the sorts of oppositions that his predecessors might have posited and thus to arrive at some opposition that is not subject to the specificity implied by supposing that the principles are perceptible qualities or bodies.⁶⁶ This allows him to subsume the doctrines of the majority of his predecessors in a way that renders them all in some sense true, but which allows him in a single stroke to improve on all of them.

Aristotle’s own position will come closer to those of his predecessors that posited the oppositions according to distinctions which he says “better known by reason” (the examples he gives of these are odd-even and love-strife, 188b34) by positing form, an enduring material, and privation as principles where form and privation represent a generalized version the specific contraries his predecessors had posited. These latter are held by the majority of commentators to stand as Aristotle’s final word as to the number and character of principles, but we will see there are some difficulties involved in supposing that this preliminary articulation constitutes Aristotle’s last word on the number and character of

⁶⁶ In this way Aristotle moves from identifying the principles *as* beings as many of the presocratics did (184b22) to seeking the principles *of* beings. Charlton argues that it is this move which brings Aristotle from “empirical” considerations of his predecessors to his own “philosophical” considerations (Charlton 1970, 66). There is something like this going on in the move to more general concepts as principles, but I would hesitate it to call it a move from the “empirical” (some other commentators might call this “scientific,” Mansfeld for example (Mansfeld 1990) to the “philosophical.”

principles.⁶⁷ For now, what is important is that Aristotle affirms the “plausibility” (εὐλόγος, 188a27) of what the predecessors “in some way” (πως, 188a26) agree about, namely, the positing contraries as the principles of nature even if this need not be his own final word.

Aristotle begins the second stage of the argument concerning contraries with a premise crucial not only to the present argument but also to the arguments in chapters seven and eight:

It must be understood [λεπτέον] about all beings that nothing whatever is by nature such as to do [ποιεῖν] or undergo [πάσκειν] change any chance thing through the agency of any chance thing, nor does anything come to be out of just anything, unless you take a case of concurrence [συμβεβηκός]. (188a31-5)

He says that he is “seeking by means of logical argument [ἐπὶ τοῦ λόγου σκέψασθαι]” (188a30) though perhaps this only tells us that he is no longer speaking dialectically or addressing the predecessors directly.⁶⁸ Does this give us license to exclude altogether the possibility that things come to be from things outside of the range of a given set of contraries?⁶⁹ The use of λεπτέον does not

⁶⁷ Cf. Gill (1989, 90-108), Wieland (1975, 134), Solmsen (1960, 74-91), Broadie (1982, 1-47).

⁶⁸ Cf. Ross (1936, 488-9). G.E.L. Owen describes the difficulty of untangling the different types of arguments succinctly: “[Aristotle], and his commentators on his behalf, have insisted on the distinction between ‘physical’ and ‘dialectical’, or ‘logical’, or ‘universal’ arguments; and no doubt some of the reasoning in the *Physics* falls within this first class. ... The ‘logical’ arguments can hardly be marked by their generality... nor the ‘physical’ by their reliance on the special theorems of physics (the ‘logical’ may also do this, 264a24)” (Owen 1975, 125).

⁶⁹ Bolton argues that in the arguments of chapter five there is no appeal to ‘*a priori*’ argument and is forced to conclude that if it were the case that “If it *always* did happen that what is white came to be from what is musical, that is, if all and only musical things became white owing to something about musicality, which is not conceptually impossible, then Aristotle could not say that white comes to be by nature only from a contrary and otherwise accidentally” (Bolton 1991, 25). If this is the case, as he points

necessarily imply that we should expect a solid argument to establish the conclusion follows. It must, in this case, be closer to “one must suppose.” If we *suppose* it to be the case that nothing does or suffers anything by chance, arguments and experience may be able to confirm this. It is unclear whether such a proposition could ever be demonstrated in a rigorous way or that Aristotle thought it could be.

There is in fact precedent in Greek literature for the view of change that Aristotle is attacking here. In Homer’s *Odyssey*, Proteus is said to be able to “take the form of all creatures that come forth and move on the earth, he will be water and magical fire” (Lattimore 1965, IV 417-8). When Odysseus and his companions confront the wily god it is said of him that, “First he turned into a great bearded lion, and then to a great serpent, then to a leopard, then to a great boar, and he turned into fluid water, to a tree with towering branches [etc.]” (Lattimore 1965, IV 456-8). While it is true that Homer is not one we would immediately consider as a predecessor of Aristotle, it is conceivable that he might have had some such image in mind if in fact the idea that things come from contraries and not any random thing really needs justification.⁷⁰ In this regard (as we tried to show in a previous chapter), Aristotle is just as much competing against rival claims of the poets as he is of his more philosophical predecessors.

out, Aristotle is not justified in making any such universal claim about the principles of change which could not be invalidated by further experience. Charlton argues that Aristotle is arguing from *a priori* grounds that at 188a30 he calls the argument “logical” (1970, 65-66). On the difficulty of determining the sense of “logical” in this context see previous note. Cf. also Broadie (1982, 6-8).

⁷⁰ It is interesting to note that the earliest known occurrence of the term nature (φύσις) in Greek literature is Homer’s *Iliad*. Cf. Liddell and Scott (1996, 1964). The significance of this was pointed out to me by James Carey at lecture at St. John’s College in 1998.

If the poets are more persuasive and it is conceivable that things change at random with no rational cause (other than by a god's whimsy), we are left in a position equivalent to admitting that change as such might not be scientifically knowable.

Establishing that change does not happen at random is crucial in establishing an alternate view to that of Parmenides which denies the knowability of the movable as such. The thesis that nothing can come from nothing is closely related to the possibility that things can come to be from other things by chance, that is, without rational connection.⁷¹ What would be the difference in saying that one thing replaced another by chance⁷² (one way of saying that one thing became another) and that the first thing became nothing and the second arose from nothing in its place? By establishing that the opposites are connected in the phenomena in an essential way is also to establish that things do not come to be out of nothing or pass away into nothing.

Aristotle extends the general argument to clarify that even changes among composite beings are changes between contraries. In the case of composite beings, it is more difficult to see that the termini of change are oppositions because often the privative state of affairs which stands in as a contrary has no name (188b10). A house comes to be from "what is not put together but from

⁷¹ For a discussion of the connection between random changes and change *ex nihilo* and the implications such a possibility holds, see Bolotin (1998, 26) and Broadie (1982, 5-9). It is peculiar to say the least that it is precisely this idea of something happening by concurrence (κατὰ συμβεβηκότος) that allows Aristotle, in chapter eight, that is the basis of the refutation of the Parmenidean objection that something cannot come to be from what-is or what-is-not.

⁷² For the problem of "sheer replacement" see Broadie (1982) and Gill (1989).

these things separated in this way” (τοῦ μὴ συγκεῖσθαι ἀλλὰ διηρῆσθαι ταδὶ ὥδι, 188b18). This very complicated locution for the “not-house” from which a house comes to be is meant to indicate what must be read into the notion of the “not-house” if it is to express the actual and accurate state of affairs from which houses actually come to be. The most important phrase in the would-be name is the “*in this way*” for if it the not-house were not situated in some particular way, we would have no way of distinguishing it from any random state of affairs that might be construed as preceding the existence of the house. That is, we could not distinguish what ordered arrangement a house actually comes from the contradictory of a house or the non-house.

Aristotle can now draw the general conclusion that all changes take place between contraries: “So if this is true, everything that comes into being would come from, and everything that is destroyed would be destroyed into, either its opposite or what is between them” (188b22). That is, the case is plausible that both simples and composites come to be out of contraries (or at least somewhat determinate oppositions in the case of composites), we should be satisfied that in all cases the things that come into being come from their contraries.⁷³

In chapter six Aristotle returns, having answered at least preliminarily the question of the nature of the principles, to the question of the number of principles with which he began. He takes it that the options that the opposites could be one or infinite were justifiably rejected on the grounds that they make

⁷³ Aristotle has left out the possibility that something simple could come to be out of a compound or that a compound out of something simple. Whether this has any major consequence will depend on whether Aristotle would admit such changes actually occur.

nature unintelligible *vis a vis* what has already been said about the Eleatics and Anaxagoras: “They cannot be one, since the opposites are not one and the same; and they cannot be unlimited, since if they were, what is would be unknowable” (189a13).⁷⁴ Eleatic monism does not permit opposites to be principles because necessarily they are not the same as each other (189a12). Thus, if we suppose, against the Eleatic thesis, that the movable world is knowable by means of principles, it is necessary that the principles are two, three, or a greater finite number.

Aristotle suggests that a principle of economy should govern how many principles one ought to posit (189b16-28, cf. 189a15-16). He never rules out the possibility that the principles may be more than three on any other grounds. Traditional interpretations often suggest that the result of the present argument that the principles must be three represents Aristotle’s final word on the subject. Yet the text which closes the section indicates that he seems to think that this is still “a very difficult question” (189b28). Though Aristotle does not at this point explicitly say why the question of the number of principles is still a matter of difficulty, he will in chapters seven and eight give arguments that indicate what is at stake in claiming that the principles are two or three.

We need to remember that even at this point in the argument of book one, Aristotle has not begun to speak entirely in his name. He has been, and is throughout chapter six, engaging his predecessors for the most part on their own terms and considering the consequences of their positions. In chapter six this is

⁷⁴ It is worth noting that he reiterates his rejection of Anaxagoras’ position on the grounds that “what is would not be knowable” (189a12).

indicated by the fact that it is primarily aporetic in approach.⁷⁵ What are almost universally held to be Aristotle's views are actually resolutions to *aporiai* that Aristotle does not explicitly, at least not immediately, endorse as his own. Aristotle's solutions to these difficulties are reserved until chapter seven where there is still some question as to what extent he endorses the point of view he proposes.⁷⁶

After it has been supposed that the principles must in some way be contraries, it is plausible (τινὰ λόγον, 189a21-22) that oppositions "both must act on a third thing distinct from them" (189a26). The contraries themselves cannot act on each other because they destroy each other (*Physics* 188a28, cf. also *Phaedo* 69e-72e and 103b-104c). Since it cannot be the case that one contrary actually becomes the other or that the other comes from it or that they even act on each other (cf. 188a28), it becomes necessary to posit some third thing which is not a contrary but something in which both contraries reside at different times during a change. Aristotle intimates that Empedocles and others must have had this insight. Empedocles posited elements in addition to the contrary principles Love and Strife: "For Love does not bring Strife together or make anything out of it, nor strife out of it, but both act on some other third thing. And some assume even more things out of which they construct the nature of things" (189a25).

⁷⁵ This is also Charlton's reading of the chapter (1970, 67-9).

⁷⁶ In the following line Aristotle refines the basic view of his predecessors to arrive at his own: "It was said earlier that only the contraries were starting points, but later that something must also underlie them and that they be three; but from what is being said now, it is clear what the difference between the contraries is, how the starting points stand to one another, and what the underlying thing is" (191a15).

Aristotle does not initially put forward the idea that some substrate is necessary to underlie the contraries as his own. Rather, he raises difficulties that might arise from *not* supposing some third thing as well as from supposing there *is* some third thing: “But on top of these things one produces the further impasse if someone were not to set down some nature different from the contraries, since of no thing do we say the contraries constitute what it is” (189a28). He does not, at least yet, positively affirm the *necessity* of some underlying thing. If there was perhaps some other way of understanding motion, perhaps it would not require the kind of underlying thing that supports contraries as a continuant.

What then, he asks, is the relation of the contraries to this third, underlying thing if we posit it? This question concerns the *priority* of the contraries and the substrate and this could generate a problem since we are looking for *first* principles: “but the starting point should not be predicated of any underlying thing, for it would be a principle of a principle” (189a30).⁷⁷ That is, the contraries will no longer meet the criterion of “primary oppositions” which “do not come from anything else” (188a27) and should not be predicated of anything else. That is, the opposites will not be primary if they are predicated of that in which they inhere (189a31). The question is whether there is a conflict between the criterion for establishing that something is a first principle (i.e. that they “not be from each other or from anything else” (188a28 ff.) and the current problem that if we posit a third thing there seems to be something prior in the sense that something is predicated of it. The crux of the ἀπορία is that what is

⁷⁷ Sachs translates ὄρχή as “source” here. I have modified the translation to read “principle” instead in order to maintain consistency.

predicated *of* is prior to what is being predicated: “For the underlying things is a source, and seems to be prior to that which is predicated of it [πρότερον δοκεῖ τοῦ κατηγορουμένου]” (189a31). Once again, Aristotle does not explicitly endorse a positive resolution.⁷⁸

There is a further problem from the point of view of Aristotle and his followers. Since “*we*” do not admit that “one reality [οὐσία] is the opposite of another,” and opposites are in fact principles, how can opposites constitute the reality of things (189a33)?⁷⁹ That is, “how could an οὐσία be derived from what are not οὐσίαις” (189a34). Aristotle’s response to this puzzle is that it is necessary, in the end, to posit some third thing if we are to hold as true “both the earlier argument and this one” (189b1). The two arguments he seems to refer to here are 1) that the first principles are contraries and 2) that οὐσία cannot be constituted simply from contraries. As for what this third thing is, he entertains the ideas of the predecessors that it could be earth, air, fire, or water rejecting them on the grounds that they are already bound up with contraries. What is required at this point to solve the ἀπορία of the generation of substances out of

⁷⁸ Aristotle seems to have skirted the problem of the priority of the principles unless the underlying thing also requires that the opposites be prior and cannot be thought of as separate. We then have a strange case of mutual priority. Characteristic of the underlying thing is that it should have “the least perceptible differentiating feature” and least “tangled up with opposites” (189b9).

⁷⁹ But contrast 186a21 for a way in which substances are contraries: “For a human being is different in form [εἶδει] from a horse and are contraries [ἐναντία] to one another.” This is indeed a very strange use of the term “contraries,” but if we give Aristotle the benefit of the doubt that he was not just being sloppy we should assume this use is deliberate. At this early stage of book one, this employment of “contraries” foreshadows the difficulties that emerge from trying to reconcile the general account of generation in I.7 with the phenomenon of substantial generation.

contraries is some substrate that is “between” (μεταξὺ, 189b2 and cf. 188b23), something that is as much as possible devoid of “sensible differences” (διαφορὰς αἰσθητάς, 189b7).

Although Aristotle appears to have rejected the possibility that the principles can be two, he has not yet addressed another sense in which the principles may be thought of as two. Later he mentions briefly that the oppositions themselves may be considered as one which is either present or absent (191a7). That he still holds open for question that it is possible to posit only two principles is evident also from the last lines of chapter seven where even though he indicates that it has been argued that they are three he qualifies this with the caveat that it has been said “in what way” they are three (πῶς, 191a21). Another sense in which the principles may be thought of as two is in number. The principles may be three in speech but Aristotle considers them as two in number (190b25). But this raises difficulties we will address further on when we determine what Aristotle himself thinks are the best candidates for the principles of change. Aristotle ends the chapter with the confidence that he has ruled out the possibility that the principles are one, unlimited, or a finite number more than three. But whether they are two or three, he says, “is a great impasse” (189b29).

2.5 Aristotle’s Analysis of the Coming-to-be in General

In chapter 7 of *Physics* I, Aristotle lays out what appears to be his considered view of how to characterize and enumerate the principles of change

(what “we say” about the subject, ἡμεῖς λέγωμεν, 189b30). This account, moreover, is purported to be the basis of the solution to the Eleatic paradoxes his predecessors faced in establishing the study of nature as a legitimate science. Most commentators believe wrongly that the analysis of “coming-to-be generally” (περὶ πάσης γενέσεως, 189b30)⁸⁰ in I.7 is meant to apply universally to all types of change. Despite differences on other issues in this chapter, commentators almost universally agree that Aristotle’s intention was to provide a single comprehensive account of change. Aristotle of course has led us to this expectation through the progression of *Physics* I. However, closer inspection reveals that Aristotle did not mean the general account of I.7 to apply all types of change. There are in fact two stages to the argument in I.7, the first of which applies to change “in general” and the second of which applies to a special case of change, i.e. substantial generation.

In addition to the rhetorical clues that indicate this division, the main support for this interpretation is Aristotle’s use of the term ὑποκείμενον (underlying-thing or substrate). It is not often recognized that in these passages Aristotle varies the meaning of ὑποκείμενον depending on whether he is talking

⁸⁰ The usual translation of πάσης is “all” which implies that the account that follows applies to *every* case and genre of change. This is the reading of the majority of commentators, and I argue against it in what follows. The sense of πάσης can also be translated as “generally” and in this case should be. This translation exempts substantial generation from the restriction of the preliminary account of coming-into-being that it necessarily require a persisting substrate. Further, the case of the generation of substances is introduced with the phrase “But becoming is meant in more than one way...” (190a31) which indicates something other than a strictly univocal universal account. Cf. translator’s note to Philoponus (1994, 160n39): “On *Phys.* 189b30 (pp. 151-2 Vitelli) Philoponus explains that one cannot give a generic account of ‘coming-to-be’ (*genesis*), and that the ‘general’ (*katholou*) treatment of it will deal in fact with what is ‘specific but applicable to many things’ (*pleiosi epharmattonta*).”

about substantial change or change in general. Because Aristotle employs the idea of ὑποκείμενον in the case of change in general as both “that-from-which” a change takes place and a constituent and in the case of substantial generation as the terminus only we should expect the analysis of change to differ according to each sense of ὑποκείμενον. If we try to read all cases of change according to a single meaning of ὑποκείμενον, we will find that we run into all sorts of interpretative pitfalls the most troublesome of which is supposing Aristotle accepts prime matter.

Were Aristotle’s goal in I.7 to establish a comprehensive account of change, he could not do this by recourse to the general account position usually assumed by commentators to be universally valid for all types of change. An analysis of I.8 will show that Aristotle’s attempt to bring the results of the general account of change from I.7 to bear on the Eleatic problem that no thing can come to be from what-is or from what-is-not does not result in an adequate solution to the Eleatic injunction prohibiting the science of nature. We have illustrated that throughout the course of book one this problem is the fundamental obstacle that Aristotle feels he must overcome if he is to set a firm foundation for his physics. The application of the general three-principled analysis of change in I.7 to this problem provides only a partial and problematic solution to the Eleatic paradox of motion. This is especially noteworthy considering that Aristotle at one point claims that this is the *only* solution to the Eleatic dilemma concerning the intelligibility of change (191a23).

i **The Division of the Argument of Physics I.7**

Aristotle's discussion of generation is divided into two parts in accordance with the methodical guidelines Aristotle set out in *Physics* I.1. First he discusses "coming-to-be in general [περὶ πάσης γενέσεως], since the natural procedure is first to say what is common [τὰ κοινὰ] to all cases, and only then to consider what is peculiar [or proper] concerning each [τὰ περὶ ἑκάστου ἴδια]" (189b31).⁸¹ The analysis begins with observations of the way change reveals itself in ordinary speech and perception (what is more familiar to us), then moves to what is more knowable by nature (to the more proper, guiding meaning which reveals the deeper meaning of the general, naïve view).⁸² This method is reflected in the transition from the discussion of coming-into-being in terms of alteration (the examples of the educated man and of the statue) to the discussion of simple coming-into-being or coming-into-being simply. Aristotle's discussion divides along these lines from 189b30 to 190a31 where we find the general discussion of coming-into-being and from 190a31 to 190b16 where he discusses the special

⁸¹ Liddell and Scott (1996): "ἴδιος II.3 peculiar, appropriate, ἴδια ὀνόματα proper name, [...] IV characteristic property of a species" (1996, 818). Compare "only realities are said to come to be properly [ἀπλῶς]" (190a33). Many translators translate ἀπλῶς as if it meant to signify that this coming-to-be is the coming-to-be of simple beings, but it could just as easily be signifying the *type of* coming-to-be that is being dealt with, i.e. generation in its 'simplest' sense. Spangler accepts the same translation of ἀπλῶς: "Yet it is substance alone which, in the *Physics*, Aristotle claims can be properly be said to come to be (190a33)" (Spangler 1979, 102).

⁸² This procedure follows closely the method outlined in *Physics* I.1. Often commentators take τὰ κοινὰ at 189b31 to indicate that the treatment following is universal. This neglects the reference to the methodological statements in I.1 that investigation into nature should move from the common and confused to the particular and more knowable.

case that reveals the underlying meaning of the rest.⁸³ This first part of the argument applies as a general analysis of change as we experience and speak about it while the second portion addresses the proper meaning of coming-to-be which is initially less accessible to us. The rest of the chapter derives from these considerations an apparent resolution to the question of the number of principles which was posited as the objective of book one in chapter 2.

ii Traditional Interpretations

One of the basic premises of the traditional interpretation is that Aristotle employs the conclusions from chapters five and six in an analysis of the way that we generally *speak* about all coming-to-be.⁸⁴ On this interpretation, Aristotle

⁸³ This division of the chapter corresponds formally with the division made by Barrington Jones: “He begins by considering coming-to-be in general... The inquiry into coming-to-be falls into two parts. The first 189b32-190a31, concerns alteration, nonsubstantial change; the second, 190a31-b17, substantial change, the coming into existence of substances” (Jones 1974, 478). Dancy objects: “I do not understand what Jones makes of the structure of this chapter” arguing that “the first part of the chapter [according to Jones’ division], which immediately follows, is not restricted to alteration” (Dancy 1978, 385n35). Dancy conflates alteration and generation seeing generation *simpliciter* as a more “drastic” coming-to-be. Though I agree with Jones’ division of the argument, we are nonetheless at cross purposes. For, making the opposite mistake of Dancy, Jones dissolves the distinction between alteration and simple generation by eliminating from the meaning of underlying thing in alteration the characteristic that the substrate remains: “there is no reason why the animal should not come to be from the embryo in just the same way that the statue comes to be from what is in fact said to come from – the unshaped piece of bronze. Just as that piece does not remain throughout the change, so neither does the embryo survive the birth of the animal that it comes to be” (Jones 1974, 490).

⁸⁴ Representatives of the traditional view include Aquinas, Owens (1981, 122-136), Ross (1936, 345-6), and Joachim (1999, xxxi-xxxiii and 92-94). Even many of the opponents of the traditional view hold that the three-principled account is universal despite differing from the traditional interpretation in other ways (especially on the question of Aristotle’s commitment to a view of prime matter). Ultimately Alan Code shares the traditional view (“the discussion of the musical man at 189b32-190a31 is meant to demonstrate the relationships which hold between the three elements of change even in

accounts for the possibility of change by showing how contraries must replace one another in an underlying substrate which remains throughout the change. The “uneducated-man” becomes an “educated-man;” the contraries are uneducated and educated and what persists as substrate is the substance or subject man. The traditional interpretation holds that the three-principled account of change applies equally for all cases of coming-to-be whatsoever. Aristotle answers the question of the nature and number of principles necessary to account for the possibility of change, the task which he set for himself at the beginning of book one.

A wealth of scholarship has shown that the traditional interpretation is more problematic than it might initially seem.⁸⁵ The traditional interpretation begins to find trouble when it tries to account for a special case of change, that of simple generation or substantial change (ἀπλῶς δὲ γίνεσθαι τῶν οὐσιῶν μόνον, 190a32). The standard three principle approach stumbles when it tries to

substantial generations” (Code 1976, 363)). He does this, however, guided by a principle of a perspectivism which allows him to avoid an appeal to prime matter which most of the traditional interpretations accept: “Thus as our interests dictate our choice as to which entity we consider the substratum [the persisting matter or the privation which is destroyed], so also will we vary our decision as to whether the change in question should be considered an alteration or a generation” (Code 1976, 365). Also, Gill accepts the three-principled approach but in a way so qualified as to not require a doctrine of prime matter: “*Physics* I.7 demonstrates that all processes involve three principles.” (Gill 1989, 98). Traditional interpretations often but not exclusively overemphasize Aristotle’s preoccupation with ordinary language as a means of investigation. Wieland: “*In the whole investigation he never quits the realm of the analysis of the way we speak*” (1975, 133); “What finally results from the comparative analysis of these linguistic structures (which I do not pursue here in detail) is simply the familiar triad of principles – matter, shape (or form), and privation – in terms of which all examples can be interpreted” (1975, 134, my italics). See also Owen (1975), Jones (1974, 476-8), and Bostock (1982, 179-96).

⁸⁵ Cf. especially Charlton (1970, 83-4 and appendix: 129-145), Gill (1989 38-40 and 42-6), Code (1976, 362-65), and Bolotin (1998, 17-24).

identify what persists as an enduring substrate in substantial generation. The seed, Aristotle's central example of simple generation, which he says is the substrate *from which* a plant or an animal comes-to-be (οἷον τὰ φυτὰ καὶ τὰ ζῷα ἐκ σπέρματος, 190b5), does not appear to survive the transformation into what it becomes (unlike the man who presumably survives his education). The solution that the traditional interpretation often offers is that even if the seed does not, *something* must and does in fact survive the transformation into substance, namely an amorphous and unknowable (except by analogy, cf. 191a8) prime matter.⁸⁶

The greatest risk involved with the idea of prime matter is that it threatens to dissolve the distinction between alteration and the generation of substances, a distinction that is at work in *Physics* I but explained in detail elsewhere.⁸⁷ The

⁸⁶ Kathleen Cook has argued compellingly against the views that it is prime matter that is made knowable by the analogy as well the alternate interpretations of this passage given by Charlton (1970, 78-9) and Barrington Jones (1974, 494-7), cf. Cook (1989, 105-119 and (against Charlton and Jones) 110-112). The contemporary debate over Aristotle's views about prime matter begins with a paper by Hugh King (1956) which was in turn criticized by Solmsen (1958) and A.R. Lacey (1965). William Charlton wrote two influential papers on the subject, the first an appendix to his translation of *Physics* I & II and the second in 1983. H.M. Robinson in turn replies to Charlton's first article in 1983. Between these articles, the evidence both for and against prime matter has virtually been exhausted, and yet there is still no consensus on the matter. I am not able to do justice to this debate with my brief remarks on the subject. I would refer the reader to the mentioned articles for further study. I also cannot in this context present a defense of my view (that prime matter is unnecessary and even misleading for the interpretation of Aristotle's considered view) which would do justice to the arguments to the contrary in this debate. The reasons I have adduced here are at least adequate to the present argument. Suffice it to say that I am in agreement with the arguments of King and Charlton.

⁸⁷ Aristotle's most terse discussion of the distinction between alteration and generation *simpliciter* is found in *On Generation and Corruption*: "We must now explain the difference between generation and alteration, since we say that these changes are different from one another. The substratum is one thing and the affection whose nature is to be predicated of the substratum another, and either of them can change. So it is alteration when the substratum remains, being something perceptible, but change occurs

issue of prime matter in effect becomes a non-starter once we recognize that the three-principled account is not meant to be universal in scope but to encompass only those types of change other than the special case of substantial generation. This is the position I argue for in the following.⁸⁸

In order to oppose the view that Aristotle employs a concept of prime matter, one of two strategies must be utilized: one must either 1) deny that there is a persistent underlying thing in *any* kind of change as Barrington Jones does,⁸⁹ or 2) deny that Aristotle claims that there is a persisting substrate in the case of substantial generation. Jones is led to the first view by relying too heavily on the role of linguistic analysis in Aristotle's account. In a reversal of the traditional interpretation, he reads the model of substantial generation, which in his analysis does not require a persisting substrate, back into the other varieties of change. He supports this with a detailed analysis of Aristotle's appeal to the way we speak about change. From the point of view of method, Jones has mistakenly taken Aristotle's analysis of common linguistic usage as his final word. Aristotle's

in the affections to it, whether these are contraries or intermediates. For example, the body is well then ill, but remains the same body; the bronze is now round, now a thing with corners, but remains the same [bronze]. When, however, the whole changes without anything perceptible remaining and the same substratum, but the way the seed changes entirely into blood, water into air, or air entirely into water, then, when we have this sort of thing, it is a case of generation (and corruption of something else)" (319b6-18, Williams translation).

⁸⁸ It is not as if Aristotle emphatically steers us clear of considering the consequences of positing or not positing an of idea prime matter. Bolotin criticizes Charlton on the grounds that: "Charlton fails to recognize, however, how much Aristotle himself contributed to the traditional misinterpretation of his text, and thus he also fails to wonder why Aristotle might have chosen to do so" (Bolotin 1998, 28n21). He at the very least allows the reader room to speculate about prime matter as a possible solution to the problem of substantial generation even if he does not ultimately endorse this position.

⁸⁹ Cf. Jones (1974, 486-8 and 490).

employment of common linguistic usage usually constitutes his *initial* word on a given subject investigated. The conclusions Jones draws borders on the bizarre. He thinks that even in the coming-to-be of an artifact like a statue, the bronze which is the substrate does not remain as the same bronze from the beginning to the end of the process of composition.

Both Jones and the traditional interpretation committed to prime matter are misled by the density of the passage which quickly moves from the account of substantial change to those changes that are its necessary concomitant changes:

For always there is something that underlies, out of which the thing comes into being, as do plants and animals from seed. The things which simply come to be some of them do so *by* change of shape, like a statue, some *by* addition, like the things which grow, some *by* subtraction, as a Hermes comes to be out of stone, some *by* composition, like a house, some *by* alteration, like things which change in respect of their material. (190b5)⁹⁰

Commentators often identify these illustrations *as cases* of substantial generation.⁹¹ Change of shape, addition, growth, subtraction, composition, and alteration each have a more or less easily identifiable persisting substrate. If these illustrations are meant to be examples of substantial generation, then we could not avoid the conclusion that substantial generation as well must have a

⁹⁰ Compare with the discussion of Anaxagoras who conflates change by composition with substantial generation (188a9 ff.)

⁹¹ Commentators often take it that, for example, the coming-to-be of a statue is a case of substantial generation (Code 1976, 357-8; Jones 1974, 483-9 and especially 487). And even though substantial generation is in some sense a paradigm for the other sorts of change, this should not lead us to believe that other species of change are reducible or equivalent to it. Code's conflation is most evident in statements like the following: "In exactly the same way that we can say that when a round piece of bronze is changed into an angular piece, this is an alteration of the bronze, but a genesis of the angular and a corruption of the round; and when an unshaped piece of bronze is changed into a brazen statue, this is an alteration of the bronze, but a genesis of the statue and the corruption of the shapeless" (Code 1976, 358).

substrate that remains even if there is great difficulty in identifying it. This view also brings with it the implication that instances of substantial generation are *reducible or even identical* to other kinds of coming-to-be which involve an underlying substrate that survives the change. This is misleading.

Aristotle uses a dative of instrument (indicated by the “by” in the translation above) to show that it is *by means of* these other types of changes that substantial change can take place. The change of shape which the bronze undergoes is not itself a change of substance or substantial generation. It is *by the change of shape of the bronze* that the statue comes into being. It is not the growth of flesh, bone, and blood that is a generation of substance, but a plant or animal comes into being *by growing flesh, bone and blood*, among other things. Substantial generation is not the same as alteration or growth or diminution though it may be that these other kinds of changes *must accompany* and be present if substantial generation is to occur. For these, the changes instrumental to substantial change, it is manifest (φανερὸν, 190b10) that something comes-to-be out of some underlying thing which also endures.

This is significantly different from claiming that these illustrations are *examples* of substantial generation and that, because there is an identifiable persisting substrate in these cases, there must also be such in the case of substantial generation. It would remain unclear what the persisting substrate in the example of a seed becoming a mature living thing would be unless one supposed that the substrate of the instrumental change was also unequivocally the substrate of the substantial generation. Even if this seems plausible in the case of a statue where we can identify the bronze at the beginning of the process

as at least minimally similar to the constituent bronze at the end, it is much less plausible in the case of a seed whose substrate is some lower level substance or “this” like earth and water and an animal whose proximate matter is flesh, bones and blood. In the latter case, it is precisely because it is the underlying thing itself that changes that we cannot identify the same substrate at the beginning and the end of the process.

This difference could also be accounted for on the grounds that artifacts such as bronze statues are not for Aristotle, strictly speaking, really substances at all.⁹² Nonetheless, Jones takes it that in fact changes in substance and the coming into being of artifacts are analytically the same on the grounds that:

there is no reason why an animal should not come to be from an embryo in just the same way that the statue comes to be from what it is in fact said to come to be from – the unshaped piece of bronze. Just as that piece [of bronze] does not remain throughout the change, so neither does the embryo survive the birth of the animal that it comes to be. (Jones 1974, 490)

What Jones says of course is true of substantial generation, but to derive that conclusion from (or to project it back on) the general analysis whose primary example is that of the statue risks conflating the notions of alteration and substantial generation and thereby conflating the general account of coming-into-being with the account of coming-into-being simply.

We ought to conclude that I.7 is divided into two separate but closely related accounts of change. If we neglect this division, we run into difficulties

⁹² In the *Metaphysics* Aristotle uses artifacts to illustrate points about natural processes but notes explicitly that artifacts are not substances (*Metaphysics* 1043a4-5; cf. Kostman (1987)).

associated with the extreme versions of the views that either affirm or deny Aristotle's commitment to prime matter in the account of substantial generation.

iii Coming-to-be in General

The first part of the discussion of coming-to-be begins with a linguistic analysis.⁹³ Aristotle begins by noticing that we typically speak about coming into being in two ways by which we distinguish between the generation of “simples” (τὰ ἀπλᾶ) and that of “composites” (τὰ συγκείμενα, 189b34). In the example of human being becoming educated, we can speak of the *terminus a quo* from two points of view. In one sense it is the human being that becomes educated and in another it is the uneducated that becomes educated. In each case the *terminus a quo* is simple. And likewise the *terminus ad quem*, the final state of being educated, is also simple when considered in a similar way. But we also speak of the *termini* as compounds: the “uneducated-man” becomes an “educated-man”.⁹⁴

⁹³ Another common interpretative strategy employed by both traditionalists and non-traditionalists focuses on Aristotle's appeal to common linguistic usage (cf. Wieland, Jones, and Owen). As Jones puts it strongly: “We may dismiss any suggestion that we are dealing here with an empirical inquiry into change. Rather, [Aristotle] is considering linguistic phenomena” (Jones 1974, 478). Such an over-emphasis on Aristotle's appeal to common speech in his investigations often obscures the fact that he means to be dealing with the ‘things themselves’ even if common opinion can give us preliminary insight into the phenomena. Even though Aristotle employs considerations of the way we speak in the investigation of coming-to-be, if we restrict his conclusions to claims about language we risk violating the method of moving from what is better known by us to what is better known by nature set out in *Physics* I.1. Aristotle's account in I.7 follows closely these guidelines by moving from the way we speak about the phenomenon of coming-to-be generally to a deeper understanding of the more specific phenomenon of coming-to-be simply.

⁹⁴ We should note that the *terminus a quo* and *terminus ad quem* are interchangeable in that it makes no difference whether we say that the man becomes educated from uneducated or becomes uneducated from being educated (compare 188b1 and 188b7:

Further, when we say not only that such and such comes-to-be but that “this comes-to-be out of this” (190a5), we do not apply this to both of the simple things. Aristotle will say that properly speaking the “educated” comes-to-be out of the “uneducated” but not out of “man” (190a23-31).

Aristotle claims that one of the simple things remains throughout the process of becoming while the other does not (190a9). The man stands at the end of the process as he was in the beginning, but the predicate “uneducated” is replaced by the “educated”.⁹⁵ If both terms had remained the same there would have been no change. If neither had remained the same we would have difficulty identifying exactly what had changed.⁹⁶

“being educated comes to be out of not being educated... Similarly, being educated passes away into not being educated, and not into any chance thing other than being educated” (Charlton translation, modified)). It is not however clear that they are exchangeable in all cases of coming-to-be. A difficulty arises if we try to apply this principle of the reversibility of process to substantial change. It is not the case that we can simply switch what we designate the *terminus ad quem* with the *terminus a quo*. A seed indeed becomes a plant, but a plant, at least as an individual being, cannot become a seed. Because the plant perishes into non-being, the process is not reversible. Even if we consider the fact that plants *yield* seeds, this is not a reversal of the process that brought the plant into being.

⁹⁵ He says that the *terminus a quo* which does not remain, either as “not being educated” [μὴ μουσικὸν] or “uneducated” [ἄμουσον], does not persist “either by themselves or as components” (190a12). This means that the *terminus a quo* that does not remain is not separable in that it does not remain off somewhere by itself or in the resultant of the change.

⁹⁶ Generally speaking, what this analysis allows is that something may be the same as itself and become different from itself while remaining what it is. Both conditions must be met if motion is to be intelligible. If only one condition is met we are left with either a Heraclitean dilemma (if nothing persists through the change) or with a Parmenidean dilemma (if nothing can be different from itself in any way) either of which renders the phenomenon of change unintelligible. If the substrate can be considered as a continuant between opposites which replace one another, there is no apparent difficulty in saying that what changes both becomes other than itself and remains what it is. That is, we have reconciled two apparently contradictory positions into a single coherent position which can account for the possibility and intelligibility of coming-to-be by viewing the phenomenon of change from two independent perspectives. Cf. Code (1976).

Aristotle then claims that all cases (ἀπάντων) of coming-to-be will exhibit a common characteristic: “that there must always be [ὅτι δεῖ τι ἄετι] something underlying which is the coming-to-be thing” (190a14).⁹⁷ He goes on to note that the underlying thing can be understood in two ways:

for it is not the same thing to be a human and to be educated. And one thing persists but another does not persist; what is not opposite persists (for the human being persists), but the not-educated or the uneducated does not persist, nor what is composed of both, such as the uneducated human being. (190a17)

The question that arises is whether this statement is meant to apply to all cases of change including substantial generation or whether it is meant to be a general analysis about how we commonly speak about change.⁹⁸ The prime matter

⁹⁷ The language of “always necessary” and “all cases” is too strong for Aristotle to claim at this point since he has only addressed coming-to-be and change in a general sense. In the case of change as coming-to-be simply, the sense of “underlying thing” will have to be reoriented from the sense that it has had in the initial analysis of change in general. If however we take the collection of phrases which include words like πάσης and ἀπλως in a less absolute sense, we avoid the problems we run into when we expect an account of generation which univocally applies to all types of change. Translating the sense of “all” and “always necessary” more softly seems the reasonable route in order to avoid these difficulties. It is clearly important for Aristotle to establish that, at least as the phenomena are first known to us, something remains the same in a transformation between contraries. Further, it would be too difficult to remove the characteristic of persistence from the underlying thing as it is understood in the general account coming-to-be without significantly conflicting with our common experience (cf. 190a17). At this stage of the argument Aristotle has done nothing more than articulate how the phenomenon of change presents itself to us in a general and confused way in speech. It is only the sequel to this argument that describes generation in an absolute and the proper sense. A majority of commentators believe that Aristotle’s initial analysis of change ought to apply absolutely to all kinds of change and so take “all” and “always necessary” in the strongest possible sense. It is only then that the problem arises of trying to determine what remains as an underlying thing in the case of substantial change. This interpretation is one of the sources which often leads to the conviction that there must be some idea of prime matter playing a role in the account of substantial change.

⁹⁸ For example, Code: “So even though the example of the musical man had traditionally been taken to be a case of alteration, it seems [...] that the general points made there are intended to apply universally to all cases whatsoever of coming to be” (1976, 358).

interpretation finds good evidence for its interpretation here but only on the hypothesis that this analysis is paradigmatic for all types of change including substantial generation.

Gill offers an interpretation that follows a middle road between appealing to a concept of prime matter and dismissing the possibility that there is any persisting substrate in the case of substantial generation. Gill submits that even in substantial generation there is always an identifiable continuant in each case as the “proximate matter” of a given change or form. The proximate matter lacks form in relation to the thing for which it serves as the matter, but considered in its own right it has its own form.⁹⁹ The claim is that when a seed becomes a plant what remains throughout the process as the proximate matter would be either one or more of the elements or some mixture or even something as developed as flesh and bone all of which have some form independently of the final product of the process.

While Gill’s interpretation is compelling insofar as it makes sense of some cases of identifying a persisting substrate, she is unable to identify what remains in the specific example of the seed becoming a plant.¹⁰⁰ She is unable to address

⁹⁹ This view makes sense of Aristotle’s claim that the matter can be a substance in some way (οὐσίαν πως, 192a6).

¹⁰⁰ Several commentators note that Aristotle does not explicitly rule out that there could be one but none of them are able to give an adequate example of what the substrate might be (e.g. Gill: “This omission need not indicate that nothing survives” (Gill 1989, 103)). Code gestures toward *Generation of Animals* but only succeeds in redirecting the same problem to transitions between specific stages of growth: “At each stage of development the lack is less a perfect embryo which becomes a more perfect embryo (the form) utilizing the flesh (and eventually flesh and bone) as the matter of each transition” (Code 1976, 364-5). I would press him to say how initially the flesh or the bone came to be out of the seed if he is going to respond adequately to Charlton’s problem which he is addressing

Charlton's concern that the attempt to find a constituent substrate in the final product of the change does not necessarily identify the *terminus ad quem* as the substrate *from-which* the final product comes to be (e.g. flesh or blood or something analogous in plants is the constituent material of the final product).

Proximate matter solves the problem of the missing continuant by finding it in another context: if the seed and the plant are the termini of a process, instead of considering the seed itself *as the substrate* of the plant, we look for some 'third thing' common to them both and consider *that* the substrate of the process. The problem with this is that one can easily imagine that whatever is found to be common among the termini may not in fact be relevant to the process that is under consideration. Suppose that we find that earth and water are found in both the seed and the animal. While it is true to say that in some derivative sense that earth and water have the capacity to become a plant, this is clearly less relevant than the potentiality of the seed to do so. The mere fact that the seed and the plant have some features in common is not enough to qualify these features as the substrate(s) relevant to the process. Even Code's more sophisticated version of the proximate matter thesis makes the same difficulty clear:

Though men do come from embryos, we have seen that that from which a thing comes to be perishes upon the generation of the product, and hence is not the matter [sic. continuant] of the change. It is for this reason that men are not made of embryos. What a man is made of is flesh and bones since the primary nutrient (the menstrual fluid) is *converted* into flesh upon fertilization, the flesh is *converted* into a heart, and then through successive stages in the development and growth explained in the second book of the *Generation of Animals* a human being finally comes to be. At each stage of the development the lack is a less perfect embryo which becomes a more perfect embryo (the form) utilizing the flesh (and

eventually flesh and bone) as the matter of each transition. The end product – the man – is made of not semen or embryos, but of flesh and bone. Since this is also his matter, we are able to solve Charlton's problem without adopting the extreme position of denying the persistence of matter through substantial change just so we can say that matter is that of which a thing is made. (Code 1976, 364-5; italics mine)

The issue between Code and Charlton is whether Aristotle's idea of substrate should be understood primarily as a constituent which makes up the being which is subject to generation or whether it should be viewed as an identifying a continuant which gives the subject of generation what Gill calls 'horizontal unity.' Code's example is meant to show how a constituent can also be seen as a continuant without generating the problem that when one of the termini comes to be the other necessarily passes away, e.g. the seed no longer remains when the plant has come to be. He has merely succeeded in pushing the same problem back to another level.

When he claims that the flesh serves as both terminus and continuant, he does so on the basis that menstrual fluid is "converted" into flesh upon conception. Likewise, flesh is "converted" into the heart and the other organs. It is especially clear in the first case that we are going to find the same difficulty of finding a single identifiable substrate that serves as constituent and continuant. Again, what is the relevant common material between menstrual fluid and flesh? Code cannot get around this problem without begging the question, i.e. without reference to an unaccounted for "conversion" at some level of the larger process of biological substantial generation. Aristotle even uses the example of the seed transforming into blood specifically as an example of substantial generation

when in the *Generation and Corruption* he distinguishes it from alteration precisely on the grounds that the substrate does *not* remain:

When the whole changes without anything perceptible remaining as the same substratum, the way the seed changes entirely into blood, water into air, or air entirely into water, then, when we have this sort of thing, it is a case of [substantial] generation. (*Generation and Corruption* 319b16, Williams translation)

Even if the general account of change exemplified by the man becoming educated can account for many varieties of change and even manages to be a good description of the principles involved in change in general, it is not necessarily appropriate for understanding substantial generation. The prime matter interpretation as well as the proximate matter interpretation rely this example as the paradigm for all types of change. Now that some of the interpretative limitations of both these views have been shown, it is necessary to offer an alternative interpretation of the second part of Aristotle's argument which concentrates on coming-into-being simply.

iv Generation Proper

The second part of Aristotle's argument makes a fresh start with a familiar turn of phrase:

Things are said to come to be in many ways, and some things are said, not to come-to-be, but to come to be something. In the case of *other* things it is plain that there must be something underlying which is the coming-to-be thing. (190a32)¹⁰¹

¹⁰¹ There is a strong reminiscence of the *Metaphysics*' search for a *focal* meaning of οὐσία to which all other senses of being point (cf. Owens 1951, 116-35). Here we are in a sense looking for the guiding meaning of "coming-to-be".

That there is an underlying thing in cases of substantial change is, however, *not yet clear* from the explicated familiar understanding of change. What is the underlying thing in the case of *simple* coming-to-be? For while it is evident in the cases of the more familiar senses of coming-to-be that there is something which underlies (insofar as it survives the coming-to-be), it is less apparent *in what sense* there is an underlying thing in cases where nothing appears to survive the change. An *aporia* arises when we consider examples of the generation of full-fledged substances, for what is it that is present at the beginning that remains at the end of the change from seed to mature plant or animal (190b4)? Aristotle claims only that in the case of substances or independent things there is a substrate as “that from which” a being comes to be:

But that independent things [αἱ οὐσίαι] too, as well as whatever else simply is [ὅσα ἀπλῶς ὄντα], comes-into-being from some underlying thing, would become clear to those who examine them. For always there is something that underlies, *out of which the thing comes into being*, as do plants and animals from seed. (190b1-5)

Aristotle does not claim that in the case of substantial generation anything remains. Rather he says only that it will become clear that there is an underlying thing in the sense of *that from which* something comes to be. He in no way indicates that the underlying thing in substantial generations must be thought of as in some way remaining. By designating the seed as the substrate he calls attention to this fact. Charlton (1970, 76-77) rightly remarks that if there were to be an underlying thing in this sense, in the generation of an animal for instance, it would be flesh and bones, not the seed which Aristotle clearly identifies as the

substrate in simple coming-into-being.¹⁰² What an animal is composed of when it has come to be is an underlying thing in a different sense than the underlying thing as that from which an animal comes to be. When the mature living being is fully formed the underlying thing as material is not a substrate for change (or at least not for substantial change) in the way that the seed was a source or principle of generation.

In the course of this transition, Aristotle is attempting to clarify an ambiguity in the meaning of underlying thing (ὑποκείμενον, 190a15 ff.) which he introduced in the general analysis of coming-to-be. This is that the underlying thing can be thought of as both what is an opposition as well as what persists through the change (190a13 ff.).¹⁰³ This ambiguity is necessary if it is to play double duty with respect to the ordinary understanding of change and in substantial generation. In the former the underlying thing remains and is the

¹⁰² While Charlton accepts that something persists through a qualitative change as in the case of the man becoming educated, he is forced to conclude that there is a “serious gap” in Aristotle’s argument when it comes to identifying something analogous to an enduring substrate in the case of substantial change. Because he thinks that Aristotle holds that the underlying thing is primarily the *constituent out of which* something is made, Aristotle appears to be guilty of inconsistently using the example of the seed as the primary example of substantial change. For the seed is not properly a *constituent* out of which an animal is made (as are flesh and bone), but only *that from which* an animal begins to grow. Lennox finds the same problem in the field of biology: “If one holds that Aristotle’s theory of change requires some continuity between what constitutes the *terminus a quo* of a change and what constitutes the *terminus ad quem* of that change, biological generation presents a problem, since the matter itself undergoes radical transformations in development. What constitutes the adult is quite unlike that out of which it developed whatever description one gives of the pre-existing entity. [nt.] Unless one gives a teleological description: see Broadie (1982, 47)” (Lennox 1984, 70).

¹⁰³ As we have argued, Aristotle uses ὑποκείμενον when talking about generation in general referring to the subject which is present at the beginning of the change and at the end. However, when talking about substantial generation in particular, ὑποκείμενον cannot mean this but must mean something which underlies *out of which* something comes to be.

terminus a quo from which something comes to be. In cases where the underlying thing is thought of *only* as a *terminus a quo*, namely, in cases of substantial generation, the ὑποκείμενον does not signify something that survives the transformation. According to our initial grasp of change, the underlying thing appears as what persists through change. But on closer inspection of the case of substantial change we find that in Aristotle's account it is only necessary that the underlying thing be thought of as that *from which* coming-to-be originates but not necessarily something which remains throughout the transformation (cf. 190b3).¹⁰⁴ The procedure here, in line with that set out in I.1, is to refine the meaning of ὑποκείμενον that was employed in the initial account of coming-to-be to the narrower meaning more properly relevant to the case of substantial generation.

Charlton (1970, 75) and others note that even when Aristotle claims that it is manifest that there is a substrate, he mentions only a substrate *from which* these come to be without mentioning that that substrate must endure: "All the things that come into being in these ways obviously come *from* underlying things [πάντα δὲ τὰ οὕτω γινόμενα φανερόν ὅτι ἐξ ὑποκειμένων γίνεται]" (190b9). It could easily be inferred that since these cases also exhibit enduring substrates which are easily recognizable, that Aristotle's elision of the phrase need not void its implication for substantial generation. If we do not distinguish substantial change from changes instrumental to substantial change, we cannot be certain

¹⁰⁴ Charlton: "Aristotle does not say that anything remains, but only that something underlies, in cases of coming into existence, and that according to *De gen. et corr.* I 319b21-31... if anything did remain in all cases, there would be no such things as coming into existence, but only alteration" (1970, 77; cf. also 131-2).

that he does or does not intend to imply the necessity of a persisting substrate in substantial change. Unless one thinks that the substrate of the concomitant instrumental changes was also univocally the substrate of the substantial generation, it would still not be clear in the least what the persisting substrate in the example of a seed becoming a mature living thing would be.¹⁰⁵

There is possible objection to this interpretation in Aristotle's preliminary summation of his accounts of coming-to-be. Here he says that,

it is clear that that which comes-to-be [τὸ γιγνόμενον] is always composite [συνθετόν¹⁰⁶], and there is [καὶ ἔστι μὲν] one thing which comes to be, and another [ἔστι δέ] which comes to be this, and the latter is twofold [καὶ τοῦτο διττόν]: for [it is] either the underlying thing or the thing which is opposed [ἢ γὰρ τὸ ὑποκείμενον ἢ τὸ ἀντικείμενον]. (190b10-13)

What is the composite [συνθετόν] being referred to here? The pairing of “that which comes to be” and “that which comes to be this” or the latter which is itself twofold as “underlying thing” and “that which is opposed”? The context alone allows either reading. The grammar of the μὲν... δέ... construction, however,

¹⁰⁵ Several commentators say that Aristotle does not explicitly rule out that there could be a persisting substrate (he does not in fact deny it) but none are able to give an adequate example of what the substrate might actually be; for example in Gill: “This omission need not indicate that nothing survives” (Gill 1989, 103). Code gestures toward *Generation of Animals* but only succeeds in redirecting the same problem to transitions between specific stages of growth: “At each stage of development the lack is less a perfect embryo which becomes a more perfect embryo (the form) utilizing the flesh (and eventually flesh and bone) as the matter of each transition” (Code 1976, 364-5). I would press him to say how initially the flesh or the bone came to be out of the seed if he is going to respond adequately to Charlton's problem which he is addressing explicitly.

¹⁰⁶ Contrast the use of συνθετόν here with συγκείμενα at 189b34 and 190a3. I take it that the difference here (at least on the prevalent interpretation of the συνθετόν in this passage as the compound of form and matter in substance) is the source of Gill's “Paradox of Unity”. For an elaboration of the paradox (with respect to the current passage) that motivates her inquiry, see Gill (1989, 6-7).

suggests that the compound referred to as the pair which designates the *terminus ad quem* and the *terminus a quo*. If what was intended to be described as composite was either the substance (*terminus a quo*) or the substrate (*terminus ad quem*), that is if we were meant to consider the source or the product as a composite, this would contradict the idea that what differentiates generation ἀπλῶς from the general account is that the beings involved in former are simple or have a stronger internal unity than those which can be described as the replacement of accidents in a subject.

It is tempting to mistake the “compound” (συνθετόν) that Aristotle refers to here for the “compound” or “composite” (συγκείμενα, 189b34) that he had referred to at the beginning of the chapter: “For we say one thing comes into being from another or something from something different when we are speaking either of simple things or composite ones [τὰ ἀπλᾶ... τὰ συγκείμενα]” (189b33). There the compound was understood to be present both in that from which (uneducated-man) and that to which (educated-man) as a compound of the underlying thing and a contrary. This would be consistent with the distinction of the twofold character of the *terminus a quo* as underlying thing and opposition. In the passage cited previously this is not, however, what Aristotle is pointing out as compound.¹⁰⁷ Rather, it appears to be the “process” of coming-to-be which is

¹⁰⁷ Aristotle seems to use the notion of compound (either συνθετόν or συγκείμενα) in three different ways in *Physics* I: 1) as the composite of materials where the *terminus a quo* itself is considered as a compound of constituents (188b10), 2) as the composite of subject and predicate (189b33 ff.), and 3) as the composite of *terminus ad quem* and *terminus a quo* (190b10-14). Thus we have the 1) “what is not put together, separated in this way” (e.g. the material out of which a house is built) as a multitude of constituents understood as a compound; 2) the educated-man or uneducated-man as understood as a compound of subject and predicate; and 3) the compound of seed and plant understood

compound in that it involves both that-from-which as well as what this comes to be.¹⁰⁸

It is precisely this misconstrual of συνθετόν on which Bostock bases his argument against Charlton:

The only ground Aristotle could have for saying that whatever comes into being is a composite (συνθετός) is that we can distinguish in it two ‘elements’, one the persisting element (what underlies) and the other the acquired element (the form). [...] So he must hold contrary to Charlton’s view [that the underlying substrate need not remain], that any substance which comes into being contains both a persisting element and a form. (Bostock 1982, 189)

Contra Bostock, the two elements are the thing that comes to be (substance, e.g. plant) and what it came to be *from* (underlying thing, e.g. seed). If the compound *must* be understood as that of the opposition and subject taken together, we are forced to the further conclusions a) that the products (and sources) of things that

as the compound of *terminus ad quem* and *terminus a quo*, all spoken about as compounds. Sorting these out in an adequate way would be a project of its own.

¹⁰⁸ Jones reads this the same way: “It is reasonable to take Aristotle as making the claim that whenever there is something which comes to be, be this a “transitive” case [as in alteration] or an “intransitive” case [as in the generation of genuine substances], there is something which comes to be and there is something which this comes to be. Since there is always something *from* which what-comes-to-be comes to be, it must be that what-comes-to-be is always analyzable into two factors” (Jones 1974, 491). Bostock’s analysis of Aristotle’s ‘inconsistencies’ between oppositions and form / privation’ are justified to an extent, although he is wrong to think this is attributable to Aristotle’s carelessness. Bringing the inconsistencies between chapters six and seven into relief, he writes, “Our principles must somehow include (a) substance, which they would not do if they consisted just of opposites: the required ‘third principle’ *must* apparently be (a) substance. But it is not very clear what happens to this argument when we generalize the notion of a pair of opposites to that of form and its privation” (Bostock 1982, 193). We need to keep in mind that in chapter six Aristotle is working from the theories left to him by his predecessors and will only salvage what is salvageable. Chapter six does not necessarily reflect Aristotle’s considered view.

come to be simply must be composites,¹⁰⁹ and b) that there must be some underlying thing (which is one member of the compound) that survives from beginning to end even in substantial generation. By doing this we lose the distinction which, on my interpretation, Aristotle was trying to illustrate by distinguishing the general way we speak of coming-to-be and the account of coming-to-be simply. At the same time we risk conflating the unity of a substance and its accident with the internal unity of a substance.

v Number of Principles

Aristotle ends the chapter by drawing conclusions concerning the number of principles we must accept if we accept the analysis of coming-to-be he has just outlined. In one sense we ought to conclude that the principles are two insofar as the contraries or oppositions are two (190b29 ff.). But insofar as opposites cannot *act* on one another it is necessary to posit an underlying thing and in this sense the principles ought to be considered three (190b33 ff.).¹¹⁰ This is not to say that the principles are *really* two or three (i.e. two or three in *number*), but that only insofar as we consider one of the principles (the underlying thing) to be

¹⁰⁹ That is, substances themselves are composites of an underlying thing and a contrary whereas before the compound [συγκείμενα, complex] was made up of substance and accident.

¹¹⁰ The references to I.6 are obvious. However, it was argued earlier that the views of I.5 and I.6 are likely not to be Aristotle's own, so we need not conclude here that the appeal to similar ideas reflects Aristotle's considered view (cf. Charlton 1970, 66-9).

diverse in nature can we consider the principles to be three.¹¹¹ We know only that the principles are three in articulation but perhaps only two in number (cf. 190a15 and 190b24). Aristotle makes a preliminary conclusion concerning the number of principles reiterating the sense in which they are either two or three “and *in what way* they are so”:

It is clear that there must be something to underlie the opposites, and the opposites must be two in number [so that the principles must be three]. Yet in another way that is not necessary. One of the opposites, *by its absence and presence* [τῇ ἀπουσίᾳ καὶ παρουσίᾳ], will suffice to effect the change. (191a4-7)

Aristotle then surprises us when in the last line of the chapter he will tell us “that the principles are three, and how, and what the manner of them is, is clear” (ἀλλ’ ὅτι αἱ ἀρχαὶ τρεῖς καὶ πῶς τρεῖς, καὶ τί ὁ τρόπος αὐτῶν, δῆλον, 191a21). The “manner” in which they are three is in virtue of there being three articulations relevant to the analysis of change in general, but in *number* we must reserve the possibility that the principles are only two.

This is surprising in that he seems still to have provided no decisive evidence to choose three principles over two especially in the case of substantial generation. In fact, if we hold him to his word that the underlying thing is one *in number* even though it is two in meaning (190a15 and 190b23)¹¹² with his further

¹¹¹ From one perspective the underlying nature is the same as what is opposed, but from another they are different in essence, i.e. “the being of a man is different from the being ignorant of music, and the being of shapeless from the being of bronze” though they are one in number (191a2, cf. 190a15 and 190b23).

¹¹² Aristotle’s assertion of numerical identity is explicit: “something must always underlie the coming into being, and even though this is one in number, in form it is not one [καὶ τοῦτο εἰ ἀριθμῷ ἔστιν ἓν, ἀλλ’ εἶδει γε οὐχ ἓν]” (190a15); and, “but while the underlying thing is one in number, it is two in kind [ἔστι δὲ τὸ μὲν ὑποκείμενον ἀριθμῷ μὲν ἓν, εἶδει δὲ δύο] (since the human being or the gold or in general the

claim that one opposite may suffice as a principle change (191a6), it would appear that the principles are more truly only two in number. For even though the underlying thing may be diverse in meaning the fact that it is one in number casts greater weight on the argument that the principles are only two.

Indeed, in the case of substantial generation the two principled scheme squares better. For one of our three principles is that which survives the change. In changes exemplified by the uneducated-man becoming educated and the coming-to-be of the statue, all three principles are more clearly present. We have the underlying thing, both as the *terminus a quo* (uneducated) and as persisting substrate (the man), and the opposition which comes to be (educated) in the substrate. Since there is no clear contrary of a substantial being, in the case of the generation of a substance we can only identify the underlying thing in one of its senses (i.e. as an opposition of privation), so we are left with only two principles: the underlying thing as privation (seed) and the *terminus ad quem* as that which is opposed.¹¹³ The only thing that is clear about this resolution to the

material is countable, for it is rather a *this*, and not incidentally from it does the thing that comes into being come; but the deprivation or opposition is incidental)” (190b23).

¹¹³ See 189a32 for the difficulty of identifying substances as oppositions (cf. also *Categories* 3b24-27 and Simplicius 1997, 35-7). However, contrast 186a21: [...] “for a human is different from a horse, and opposites from one another [ἄνθρωπος γὰρ ἵππου ἕτερον τῷ εἶδει καὶ τὰναντία ἀλλήλων].” The claim that there must be a third principle in every case of change on the grounds that two principles cannot *act* on one another is not an objection at all in the case of substantial generation. For if we imagine that the principles are an underlying thing from which something comes to be and some single opposition (i.e. the form which by its mere absence and presence may be sufficient to account for the change, 191a6), we are not compelled to say that the *contraries* are acting on each other (which generates the aporia from I.6), but only that the form acts on the substrate.

question as to the nature and number of principles is that it must heavily qualified if we demand a definitive answer.

The example of a seed's development into a full grown plant or animal illustrates this nicely. For in the coming-to-be of a plant or an animal we need two principles: 1) the seed as the underlying thing (as *terminus a quo*) and 2) the form of the mature plant. The seed, though one in number, acts as both the underlying thing and the opposition (ὕποκείμενον as ἀντικείμενον) while the mature plant is the fully developed form. The only requirements that the seed and the full grown plant have to meet in order to qualify as the principles of the change are that the seed be something "from which" something else comes-to-be (which in a certain sense is opposed, i.e. as the absence of form to its presence) and that the form be *present* as that to which what comes-to-be comes to be.

2.6 Solution to the Eleatic Paradox

The Eleatic opposition to the intelligibility of change has, as I hope to have shown, been the guiding theme throughout the argument of *Physics* I. Now in chapter eight, Aristotle returns to a discussion which explicitly deals with the Eleatic obstacles to founding a legitimate science of nature. Why, we should ask, does Aristotle bother to return to a consideration of the Eleatic position this late in the discussion of change? We are compelled to ask the question as to whether the discussion of chapter eight is meant to supplement, replace, or reinforce the refutations of the Eleatics at the beginning of book one. If Parmenides and Melissus had been adequately dealt with earlier in the book, it seems strange to

return to them now. The treatment of the paradox of generation from nothing in chapter eight is not, however, addressed only to the Eleatics but also to the φυσικοί that were forced to concede the Eleatic principle that something could come into being from what-is-not. Aristotle is not simply returning to the Eleatics but also resolving an ἀπορία that compelled the φυσικοί to claim that something could only come into being from what-is and thus reduce the phenomenon of substantial generation to alteration (187a30, cf. *Generation and Corruption* I.3-4).

What is remarkable is how the strategy of this refutation differs from those of chapters two and three. The earlier refutations, Aristotle told us, were outside of the scope of natural philosophy (185a1). In a certain sense they were dialectical and even sophistic or perhaps belonged more to first philosophy. The discussion in chapter eight however is explicitly based on the *physical* considerations of chapter seven. Thus this second round of refutations is made *from within the domain of physics*.

Also in chapter eight we have no indication that Aristotle is arguing from premises that he would claim that his predecessors would have accepted as he did in the earlier chapters. Here we do not have the sort of refutation that assumes the premises of the interlocutor in order to generate contradictions from them. In his confrontation with the Eleatics in chapters 2 and 3, Aristotle attempted to refute Parmenides and Melissus on their own terms. In chapter eight he is willing to employ his own ideas of accidental attributes and even potency and act. The strategy appears to be more straightforward here. Aristotle wants to strike at the root of the problem which yielded the Eleatic monism that denies not only

that reality is any kind of multiplicity but also in turn that change as such is intelligible (191a31 ff.). In chapters 2 and 3, Aristotle addresses and attempts to refute the *consequences* of Eleatic monism by pointing out the absurdities that follow from it. Chapter 8 employs the different strategy of undermining the premise upon which the monism is based, namely the principle that something cannot come into being from what-is-not.

It is clear that in I.8 he is not only addressing the Eleatics but that the arguments are also directed toward the φυσικοί who fell prey to the Eleatic paradox of motion. Aristotle returns to the problem presented in chapter four which he thinks must have motivated Anaxagoras and other post-Eleatic physicists to suppose that “the coming-to-be of a thing is a certain alteration” by means of rarification and condensation (187a30). Anaxagoras shared the “general opinion of the φυσικοί that nothing comes to be out of what is not” (187a27). The φυσικοί were led by the apparent unintelligibility of something coming from nothing to suppose that what-is must come from what already exists in some way.¹¹⁴ But the Eleatic paradox as Aristotle understands it is twofold. For not only does it show the apparent unintelligibility of the claim that what comes to be comes to be from what-is-not but also that it seems to be impossible for what comes to be to come from what-is. Anaxagoras, Empedocles, and other physicists rejected the former but were led by this rejection to embrace the idea

¹¹⁴ Anaxagoras by supposing that all things are already present in everything, Empedocles since his elements themselves never come into or go out of existence. Rejecting one horn of the Parmenidean paradox they are led to embrace the other, namely, that what comes to be must be some form that already is. Thus they do away with generation in the strong sense by reducing it to alteration.

that what comes to be must come to be from what already is. They thus leave one horn of the Eleatic dilemma intact.¹¹⁵

The Eleatic paradox of change as Aristotle relates it in *Physics* I.8 is not found verbatim in any of the extant presocratic texts. There are early versions of the paradox found in Parmenides and Melissus (Empedocles as well, but Aristotle does not mention him in this context).¹¹⁶ Because Aristotle attributes the

¹¹⁵ Aristotle only explicitly answers the Eleatic paradox with respect to one side of the full process of coming-into-being and perishing. Presumably we are meant to fill in the argument for the possibility of passing away into what-is-not by parity of reasoning (cf. Loux 1992, 282). It is likely not a coincidence that Parmenides' text also omits a parallel argument against the possibility that what passes away perishes into what-is-not or what-is. Cf. Gallop on Parmenides' fragment 8: "Finally, it is important to note that although this section purports to disprove not only genesis but also perishing (8.14, 8.21), the text, as just interpreted, deals explicitly only with the former. Presumably, an isomorphic argument against perishing has to be assumed: perishing would entail the subject's subsequent non-existence, or its dissolution into nothing; and this would be as inconceivable as its emergence from nothing. But such an argument is nowhere expressly stated, and has to be supplied from the context" (Parmenides 1991, 15-6 and cf. 35n44).

¹¹⁶ For the sake of comparison, here are the versions of Parmenides, Melissus, and Empedocles. Parmenides:

For what coming-to-be will of it will you seek? In what way, whence, did [it] grow? Neither from what-is-not shall I allow you to say or think; for it is not to be said or thought that [it] is not. And indeed what need could have impelled it to grow later or sooner, if it began from nothing? Thus [it] must either be completely or not at all. Nor will the strength of trust ever allow anything to come-to-be from what-is besides it; therefore neither [its] coming-to-be nor [its] perishing has Justice allowed, relaxing her shackles. (Parmenides 1991, fr. 8.7-14)

Melissus:

That which was, was and always will be. For if it had come into being, it necessarily follows that before it came into being, Nothing existed. If however Nothing existed, in no way could anything come into being out of nothing. Since therefore it did not come into being, it Is and always was and always will be, and has no beginning or end, but it is eternal. For if it had come into being at some time, it would have a beginning (for it would have come into being at some time, and so begun), and an end (for since it had come into being, it would have ended). But since it has neither begun nor ended it always was and always will be and has no beginning nor end. (Freeman 1971, fr. 2 & 3)

Empedocles:

Fools! – for they have no long-sighted thoughts, since they imagine that what previously did not exist comes into being, or that a thing dies and is utterly

problem to a somewhat ambiguous group of “the first to seek the truth and the nature of beings” (191a24) rather than to a specific author, it is fair to say that Aristotle’s retelling likely represents a conglomerate of the views of several distinct thinkers.¹¹⁷ His reformulation runs thus:

They say that none of the beings either comes into being or is destroyed, since it is necessary that what comes into being come either out of what-is or what-is-not, and out of both of these it is impossible; for a being would not come into being (since it already is), and from what-is-not, nothing could come into being, since *something* must underlie. And building up the result successively in this way, they say that there are not even many things, but only being itself. (191a27-33)

The first horn of the dilemma and its reason are fairly straightforward: If something already exists, there is no reason why it should need to come to be. Therefore, if something comes to be, it will not be from what already is. The reason behind the second horn is that “something must underlie” which is likely

destroyed. For what in no wise exists, it is impossible for anything to come into being; and for Being to perish completely is incapable of fulfillment and unthinkable; for it will always be there, wherever anyone may place it on any occasion. (Freeman 1971, fr. 11 & 12)

¹¹⁷ Aquinas thinks that Aristotle is referring to the material monists, but the general consensus among modern commentators is that the monism Aristotle is more directly confronting here is Eleatic (Aquinas 1999, 64-65). The history of the problem likely goes back to the very beginnings of Ionian physical philosophy and of course extends beyond the explicit Eleatic formulation. Aristotle interprets Anaximander’s supposition of the ἄπειρον as motivated by the worry that if things were allowed to perish completely, beings might eventually ‘run out’ (Cf. *Generation and Corruption* II.10). For an interesting account of Empedocles’ role in the history of the problem of coming-to-be from what-is-not, see Mourelatos (1981, 658-664). Madigan (1992, 322-3) in response to Loux shares the view that Aristotle is referencing “the Pre-Socratics across the board” and perhaps the contemporary school of the Megarians. Little is known about the Megarians, but it does not seem a far stretch to relate the brief but crucial confrontation with them in *Metaphysics* IX in the context of the investigation concerning the difference between potentiality and actuality. For an interesting account of Aristotle’s confrontation with the Megarians, see Heidegger’s lecture course on *Metaphysics* IX (1995, 148-65).

an interpolation by Aristotle given that such language is more Aristotelian than presocratic.

The particularly peripatetic turn of phrase (ὕποκεισθαι γάρ τι δεῖν) with which the formulation ends troubles commentators who worry that Aristotle might not be accurately representing the views of his predecessors.¹¹⁸ There are however several reasons why we should not be worried that Aristotle is loading the dice with the weight of his own doctrine. Aristotle does not claim to be representing the view of anyone in particular but only means to illustrate a problem that has plagued many of his predecessors. Second, just because Aristotle has used the term ὕποκεισθαι and its cognates in the chapters leading up to the present argument, this does not mean that it should already obtain the rank of a rigid technical term. Aristotle's use of the term would not have been far from common usage and would not have been foreign to the presocratics.

Further, even though *Physics* I.7 relied heavily on how we understand ὕποκεισθαι and its cognates, even there the sense of what it meant to underlie was found to be ambiguous at least as far as whether it meant something that necessarily remained throughout a change or merely what the changed thing came to be *from*. If Aristotle is using the term in the latter sense (the sense which was more appropriate for the case of substantial generation and which for the same reasons might be more appropriate here) then the reason for thinking that something cannot come to be from what-is-not is that something must underlie

¹¹⁸ Mourelatos exemplifies the position: "The 'because' clause here blatantly invokes Aristotle's own triadic ontology of matter-privation-form. If that is why Aristotle declares ENN [the principle *ex nihilo nihil*] to be pre-Eleatic in its origins and *archaion*, "ancient" (*Metaph.* I.984a27-984b1), why should we believe him?" (1981, 650).

only in the sense that we think that there must have been *something there before* the coming-into-being.¹¹⁹ Lastly, even if Aristotle is employing his own technical terminology, we have no real reason to fault him because he has not, like he did in the initial treatment of Parmenides and Melissus, claimed to be addressing his opponents on their own terms.

A potential problem arises with Aristotle's paraphrase of the Eleatic paradox if one raises the question as to whether it is meant to encompass "Being" as a whole or whether it is directed exclusively toward individual "beings." None of the surviving formulations of the problem available to us and to Aristotle formulate the problem in terms of individual beings (see the citations from Parmenides, Melissus, and Empedocles in the note above). Despite this, his understanding of what "they say" clearly attributes to them the idea that the problem concerns individual "beings" among a plurality: *καὶ φασὶν οὐτε γίγνεσθαι τῶν ὄντων οὐδὲν οὐτε φθείρεσθαι* (191a26). It is this statement that leads most commentators to treat the problem (correctly) as if it were always about individual beings.¹²⁰

¹¹⁹ Loux has the same apprehension as most commentators, but even though he thinks that as Aristotle's technical term *ὑποκείμενον* typically indicates that something persists in any change, nonetheless he realizes that Aristotle is not using it as a technical term here: "As used here, the term cannot express the idea of an enduring subject of predication; and the remark in question has to be understood to have the neutral force of 'There must be something there beforehand'" (Loux 1992, 285).

¹²⁰ This is a point where Loux (1992), Code (1976), and Lewis (1991) are all in agreement. Kelsey (2006, 335-8) claims to depart company from these three on this point by reorienting the question into terms about kinds. But since his argument consistently turns on what *kind* of thing an individual happens to be, it does not seem to be a serious departure.

Throughout the argument, Aristotle approaches the problem of generation in terms of “beings” or “what-is” or “things-that-are” (τὸ ὄν) and “not-beings” or “what-is-not” or “things-that-are-not” (τὸ μὴ ὄν). This need not present too much of a problem if we imagine that the issue might have been first conceived in terms of individual beings. And here in I.8 it is this initial conception that Aristotle attacks in order to undermine the foundation of the monism derived from it rather than showing the absurdities of the consequent monism as he did in I.2-3. Because Aristotle is trying to articulate the *source* of the resultant problematic monism, and because he attributes the formulation to a nebulous and indefinite “they,” we can safely conclude that he sees his argument as *refuting the consequence by attacking the premise on which it is based*. The consequence that these thinkers were mistakenly led to is that “there is no plurality but only Being itself” (καὶ οὕτω δὴ τὸ ἐφεξῆς συμβαῖνον αὖξοντες οὐδ’ εἶναι πολλά φασιν ἀλλὰ μόνον αὐτὸ τὸ ὄν, 191a31-33). Just because Parmenides, Melissus, and Empedocles formulated the position in terms of αὐτὸ τὸ ὄν, this does not mean that Aristotle is misrepresenting the issue. They are formulating the dilemma in light of the general consequence of the original difficulty whereas Aristotle is paraphrasing the problem’s implicit premise. If it is this question surrounding individual beings that was the *source* of the unfortunate conclusion that there is only Being, it is the predecessors’ misunderstanding of the quandry that is difficult and not Aristotle’s reorientation of it.

Another aspect of the difficulty of the paradox becomes clear once we try to imagine what an individual τὸ μὴ ὄν actually would be. The solution to the question of how something can come-to-be out of what-is-not rests in large part on how we understand what this phrase τὸ μὴ ὄν signifies. Many commentators read τὸ ὄν and τὸ μὴ ὄν as so-called incomplete expressions in the sense that τὸ ὄν means “what is ___” and τὸ μὴ ὄν means “what is not ___”.¹²¹ Each blank represents some predicate which is the feature that comes to be or passes away, for example “what is musical” becomes “what is not musical.”¹²² So then the Eleatic argument against the intelligibility of motion and Aristotle’s response to it are based on the incomprehensibility that “what is musical” becomes “what is not musical.”¹²³ This does allow for a consistent interpretation of Aristotle’s argument which employs the idea of accidental attributes but weakens the sense of the original problem to the extent that Aristotle’s solutions become superficial and superfluous.

Loux (1992, 287-90) has demonstrated convincingly that this line of interpretation deflates the force of the Eleatic dilemma almost to the point of

¹²¹ For interpretations within the general bounds of this view see Ross (1936), Code (1976), Broadie (1982), and Lewis (1991).

¹²² Perhaps not coincidentally Aristotle uses both the expressions μὴ μουσικὸν (191a1) and τὸ ἄμουσον (191a12) in chapter seven’s discussion of coming-into-being in general. This varying usage already highlights the difficulty in making sense of “what-is-not.”

¹²³ Ross remarks in his commentary on the phrase ἢ ἐξ ὄντος ἢ ἐκ μὴ ὄντος follows the interpretation of incomplete expressions: “It is not at first sight clear whether this means ‘either from what-is or from what-is-not’ [my hyphens] or ‘either from what is *it* or from what is not *it*’. But the latter seems to be the meaning, for the first of the other pair of alternatives (‘from what-is’) presents no obvious impossibility such as is referred to in a29” (1935, 464). This line of interpretation is developed by Code (1976, 163 ff.) and Lewis (1991, 228 ff.).

triviality. Of course Aristotle would likely accept the idea that τὸ μὴ ὄν and τὸ ὄν are incomplete expressions. But Loux points out this is in fact the strategy that he uses against Parmenides in *Physics* I.2: ‘Parmenides, you say that Being is One. Well, One *what?*’¹²⁴ But to suppose that the difficulty which virtually paralyzed Aristotle’s predecessors is that ‘that which becomes musical comes to be from what is not musical’ “rob[s],” in Loux’s words, “the argument of its pivotal dilemma and make[s] Aristotle’s response to it gratuitous” (1994, 288). It is worth quoting at length the conclusion to Loux’s argument:

As Aristotle sees it, the Parmenidean argument calls for more than a vindication of our commonsense belief in the reality of change. The fact is that very talented and very distinguished philosophers had been firmly in the grips of this argument. It had, in one way or another held sway over the best philosophical minds of Greece, and it had done so for more than one hundred years. An account explaining how this could have happened is no less necessary than a vindication of our ordinary beliefs. And the fact is that the responses I have just outlined [based on the account of I.7] do not provide such an account. In providing the very direct and devastating responses they do to the Parmenidean argument, they leave us wondering how any intelligent and sane thinker could have been taken in by the argument. And here the issue is not one of mere condescension or even dutiful respect. Aristotle just believes that human reason is too good a guide to permit us to be beguiled by an argument with as little substance as our two responses suggest. He believes that there has to be something right about argument if it so completely dominated the reasoning of generations of philosophers. And if there is any element of truth in the key premises of the argument, it is lost in the responses in question. So they cannot constitute the core of a response to the argument. What is needed, on the contrary, is a response that not merely shows the argument to fail in its attempt to undermine our ordinary beliefs that things undergo change, but also explains how

¹²⁴ Again, this argument *does not belong to physics*, but is rather a subject for metaphysics or perhaps dialectical disputation. Chapter eight is introduced with the explicit declaration that what follows are arguments based on the physical considerations of chapter seven.

the argument could seem as intractable as it did. And it is precisely the kind of response that we find dominating A.8. (1994, 293)

The interesting question then becomes one of motivation. If we want to look for Aristotle's solution to the Eleatic paradox, it must be a solution which not only provides a solution to a linguistic puzzle but also accounts for the effective difficulty that the problem posed to Aristotle and his predecessors.

Loux (1992) and Kelsey (2006) seem to be the most sensitive to understanding the argument from the perspective of its motivational context. Both however are too narrowly concerned with the solutions to the Eleatic Paradox that treat it as a linguistic puzzle. They approach it as if it were an isolated problem which stumped Aristotle and his predecessors when understood in a more sophisticated way than traditional interpretations allow (Loux 1992, 291). They fail to recognize that the primary philosophical motivation is the immediately contextual one which is to establish the legitimacy of the science of nature. It is with this in mind that Aristotle addresses the Eleatic paradox more than a concern for solving a troubling linguistic puzzle.

For Loux the compelling puzzle which does justice to the fact that the Eleatic Paradox held sway for several generations of thinkers is the puzzle of how the expressions "x comes to be from what is" and "x comes to be from what is not" can manage adequately and simultaneously to articulate the same phenomenon. Aristotle's solution to the Eleatic paradox hinges on an ambiguity in its expression. Aristotle brings this ambiguity to light by pointing out the difference between proper and accidental predications as in the case where, using Loux's example, "the lord of the manor takes orders from his butler". This

statement can be true when the relation being expressed here between the lord and the butler is not the normal or proper relation between a lord and a butler. When taken in the most literal sense, a lord *qua* lord does not take orders from his butler *qua* butler. Thus if we restrict the proposition to what Loux calls its reduplicative expansion (in the form of “x *qua* x”), it is impossible for it to be true. But if we consider that the butler also happens to be a military officer and the lord happens to be a private, then we can see how it might be the case that the lord might take orders from his butler. This statement can then express a truth in its non-reduplicative sense (in the form of “x *qua* y”) where the lord *qua* private takes orders from his butler *qua* officer. This is possible precisely because it is only by coincidence that the lord is a private and the butler an officer.

Loux claims that the Eleatic paradox until Aristotle’s analysis was interpreted only in the reduplicative sense for which reason it was felt to be so powerful. In its reduplicative expansion even Aristotle, on Loux’s reading, would concede the impossibility of coming into being. On the reduplicative reading both of the following are unintelligible: 1) what-is (*qua* what-is) comes to be from what-is-not (*qua* what-is-not), and 2) what-is (*qua* what-is) comes to be from what-is (*qua* what-is). Aristotle’s innovation is to recognize that such statements are not unequivocal. It is possible to make sense of the phrase “what-is *qua* what-is-not” by analogy with the example of the doctor building a house or a butler commanding his lord. The solution to the paradox that what-is cannot come to be from what-is-not hinges on removing the restriction that it be understood only in its reduplicative sense.

While Loux's interpretation is helpful in understanding how Aristotle employs the notion of accidental predication or accidental being, it suffers from some of the same pitfalls as the traditional interpretation which it was meant to improve upon. The primary point of similarity is that Loux's, like the majority of interpretations, treats the Eleatic paradox as primarily a linguistic puzzle. Because of this several aspects of the argument remain unexplained including the role of the notions of action and passion in Aristotle's formulation. The question also remains as to whether despite any linguistic incoherence Aristotle would claim that there is generation apart from what comes to be accidentally (cf. 191b10, 225a27-29, Bolotin (1998, 28n25), and compare Loux (1994, 299)).

i Reinterpreting the Solution

The most prevalent deficiency in interpretations of I.8 is the absence of any explanation of the differences between the accounts of I.7 and I.8. Because Aristotle tells us at the opening and closing of I.8 that I.7 provides the basis for the only solution to the Eleatic paradox, commentators devote a great deal of effort to finding their common thread. What is almost universally agreed upon in the literature is that Aristotle's solution to the Eleatic paradox is based solely on the idea of accidental being or accidental predication. The implication of this is that Aristotle must deny that any coming-into-being other than that which comes to be incidentally or by accident can be made intelligible in the face of the Eleatic paradox. This is an obviously unsatisfactory conclusion.

In the following I will provide an interpretation which focuses on elucidating the differences in the accounts of I.7 and I.8 in order to explore the possibility that I.8 contains an alternate approach (which does not necessarily mean a solution) to the Eleatic paradox which does not require an appeal to accidental attributes. This interpretation will also account for several features of the argument which have not been adequately addressed in the literature. One detail that has been particularly troublesome for both translators and commentators is the role and interpretation of Aristotle's bizarre example of a dog coming to be from a horse. Some translators go so far as to amend the text so that the example reads more palatably that dogs come to be from dogs and horses from horses despite the fact that there is no evidence in the surviving manuscripts to support the alteration.

The central example in I.8 is that of the doctor building a house. Aristotle uses this example to illustrate what he calls "coming-into-being by accident" (γίγνεσθαι [...] κατὰ συμβεβηκός, 191b14) which provides the key for understanding how generation from what-is-not can be possible. There is however more to this example than an illustration of accidental generation. Although Aristotle does not pursue this aspect of the example, it also provides an illustration of *non-accidental* or *per se* generation. This reading of the doctor/house-builder example sheds light on another difficult feature of I.8, namely the mention of an alternate solution to the Eleatic difficulties by means of the concepts of potency and act (191b27). This feature has troubled commentators for several reasons the foremost of which is Aristotle's insistence that the account of I.7 provides the "only" solution to the Eleatic paradox

(191a23). In addition to this, the fact that Aristotle does not explicate the appeal to potency and act leads to speculative interpretations which stray from the immediate context of the passage under consideration. I will show that understanding the role of these concepts in the context of solving the Eleatic paradox requires only that we consider their application to the example of the doctor/house-builder as I have reinterpreted it. All of this will in turn show the significance of Aristotle's rephrasing of the Eleatic paradox into the terms of action and passion, an aspect of the argument which has been almost universally overlooked.

ii Doctors Building Houses

The following quotation serves as the basis for virtually all interpretations of I.8

Now the doctor builds a house not as a doctor but as a house-builder, and turns pale not as a doctor but as tanned; but he heals or becomes a failure at healing as a doctor. (191b4)

The traditional interpretation of the example of the doctor who builds houses mirrors the traditional interpretation of I.7 in which the attribute of being educated is taken on by the substrate man. Aristotle had given us the tools we needed to solve the Eleatic paradox already in I.7 but to solve it only partially. Because the three-principled account of coming-into-being analyzed change into two contrary attributes and a persisting substrate, it showed us how what comes

to be can come from the contrary simply as well as from the compound.¹²⁵ This approach forms the basis for understanding Aristotle's claim that the Eleatic paradox can only be resolved by understanding generation in terms of concurrent or accidental attributes.

In order to circumvent the Parmenidean paradox that nothing can come to be from what-is-not or from what-is in terms of the analysis of chapter seven we must consider attributes as inhering in a subject only incidentally. If the relation between substrate and contrary is only accidental, it is permissible to say *both* that something comes to be from what-is-not and from what-is by referring at one time to the substrate and at another time to the attribute. For example, the uneducated (what-the-man-is-not) comes to be educated (what-the-man-is), and from being a man being educated comes to be *per accidens*. The man stays as he was in the beginning *qua man* but becomes educated *per accidens*. There is no change in the essence of the man, i.e. there is no generation of the man as such. It is not the uneducated *qua* uneducated that becomes educated, but the man *qua* uneducated that becomes educated *per accidens*. If the relation between man and the attribute of being educated were essential rather than accidental we would not be able to claim that the uneducated-man becomes an educated-man without falling into the difficulty of the Parmenidean paradox which is most

¹²⁵ Aristotle also mentions that sometimes we even speak as if some things come to be from the substrate alone though this is not necessarily easy to reconcile with the rest of the account, cf. 190a24. Barrington Jones bases his interpretation of the account of generation on this difficult line and ends up concluding that in substantial generation as well as generation of all kinds there is technically no enduring substrate (cf. Jones 1974, 487-8).

poignant where there is a change in substance (cf. Parmenides' fragment 8.40 ff.).

However, there is more to this example than the traditional interpretation of this analogy reveals. Not only is the doctor said to build a house as a doctor incidentally (in the same way that doctor turns pale incidentally from being a doctor but more properly from being non-pale), but Aristotle also points out that,

we say *most properly* [επειδὴ δὲ μάλιστα λέγομεν κυρίως] that a doctor does or suffers something from a doctor when *as a doctor* he suffers or does or becomes these things, it is clear that also “this comes into being from what-is-not” means the latter insofar *as it is* not [δῆλον ὅτι καὶ τὸ ἐκ μὴ ὄντος γίνεσθαι τοῦτο σημαίνει, τὸ ἢ μὴ ὄν]. (191b5)

Applying the idea of accidental being from I.8 to this paradigmatic example from I.7 is not difficult. The unmusical becomes musical; the man becomes musical. The unmusical is only accidentally not-being insofar as the lack happens to reside in something that actually is, i.e. the man as a subject. Being (musical) comes from being (a man) only accidentally, that is insofar as being musical or unmusical is incidental to being a man. This does not seem to hold exactly in the case of the doctor and the medical art. It is no accident that a doctor happens to have the medical art. If the doctor ceases to possess the medical art, the subject ceases to be a doctor. Of course the doctor remains when he becomes pale from being tan or vice versa, and it is by means of these sorts of features that Aristotle draws the distinction between accidental and *per se* attributes (κατὰ συμβεβηκός and καθ' αὔτο). But the doctor comes to be or passes away (or acts or is acted upon) *per se* when he becomes a healer or fails at healing.

Aristotle bases his explicit response to the Eleatic dilemma on the grounds that generation is like the doctor who becomes pale or tan *per accidens*. In the same way an unmusical man can become a musical man from “not being” musical *per accidens*. And thus our worry that the problem of the ancients has a strangle hold on us is relaxed. We see how at least in some way, even if not in the “most proper” sense, coming into being from what is not can be made intelligible. However, as is clearly the case with the doctor, *this is not the only way that things comes into being*.¹²⁶ Doctors do in fact become healers from not being healers.

A doctor becomes a healer from *not being* actively a healer. He moves from being a potential healer to being an actual healer, to put it in terms that Aristotle has so far avoided in this context (191b29). In so far as the doctor *is not* healing, he comes to be healing. What properly comes to be from being a doctor comes to be *not* by virtue of concurrence, *not* by accident, but *precisely* from being a doctor as such. If we were to grant that what arises from the medical art (i.e. healing) were in some way a separable accident of the medical art (as was the compound educated-man in chapter seven was separable into the simple terms man and educated), Aristotle’s conclusion would follow and the analogy between the illustrations in I.7 and I.8 would be seamless. But it is difficult to imagine any way in which healing could be merely an accident of the medical art. So, even if the doctor comes to build a house accidentally (which is a way that something can

¹²⁶ Bolotin points out that “At *Physics* 225a27-29, Aristotle does not say, as it might appear, that there is coming to be only by concomitance from what is not. What he says, rather, is that even on this supposition (a supposition which he himself has encouraged in book one, and which he might not wish to openly undermine), it is still that which is not that comes to be” (Bolotin 1998, 28n25).

come into being from what-is-not), the doctor heals not by accident but by that which follows from the doctor's essence. In this way, healing comes to be from not-healing not by accident, but in the way proper to it.

But if the solution to the Eleatic paradox is only relevant to accidental change, it does not defend *per se* change against the Eleatic accusation of unintelligibility.¹²⁷ The primary sort of change that remains undefended against the Eleatic paradox is substantial generation. Substantial generation is a closer analogue to the practicing doctor than to man becoming educated.

iii Acting and Undergoing

One idiosyncrasy of Aristotle's reformulation of the Eleatic paradox almost completely overlooked by commentators is the fact that he puts the question of generation from nothing in terms of acting and undergoing in addition to being and not-being. In the paraphrase Aristotle gives of the Eleatic paradox, he compares the coming into being of something with its acting or being acted upon:

But we say that for something to come into being out of what is or what is not, *or for what is not or for what is to do something or be acted upon* [ἢ τὸ μὴ ὅ τοι εἶν τι ἢ πάσχειν] or become anything whatever to which one might point [...]. (191a34)

¹²⁷ Kelsey sees the problem quite clearly: "This second solution [in terms of potency and act] is also essential to any full resolution of the difficulties the [Eleatic] problem raises for Aristotle. Recall that Aristotle's first solution [in terms of accidental generation] concedes that the conditions which the problem places on what substances can come from, though they do not constrain what substances can come from incidentally, really do constrain what they can come from 'unqualifiedly.' Given this, Aristotle must think that there is a way to reconcile these conditions; otherwise there would not be anything that substances come from unqualifiedly, in which case the simply would not come to be at all. [...] So, Aristotle must find something that meets both conditions, if he wants to settle fully and completely the problem he raises" (2006, 349).

Aristotle seems to be employing the same strategy as Plato does in the *Sophist* where the Stranger delimits the category of beings as those things capable of acting or being acted upon. It is not only with a similar strategy but toward a similar goal that Aristotle and Plato's Stranger attribute this fundamental characteristic to beings, namely to overcome a Parmenidean difficulty. The argument depends on the addition of "acting or being acted upon" or, again, that "that-which-is acts or is acted on". This paraphrase echoes the Stranger's hypothesis that 'being is power' at 247d ff. in Plato's *Sophist*:

I say, then, that what possesses any sort of power [δύναμιν] – whether for making [ποιεῖν] anything at all, of whatever nature, other than it is or for being affected [παθεῖν] even the least but by the meagerest thing, even if only once – I say that all this is in its very being. For I set down as a boundary marking off the things that *are*, that their being is nothing else but *power* [δύναμις].
(Plato 1996, 247d-e)

Aristotle likewise reorients the terms of the Parmenidean paradoxes of being in terms of action and passion. The significance of this other than showing a direct continuity of thought between Plato and Aristotle is that the language of action and passion takes us out of purely linguistic considerations. The employment of action and passion does two things: first it leads us away from an exclusively linguistic interpretation of the rest of I.8, and second it foreshadows an alternate approach to the Eleatic dilemma in terms of potency and act which Aristotle alludes to near the end of the argument of I.8.

iv **Dogs Born from Horses**

There is disarray among translators and commentators as to what to make of what at first glance appears to be a bizarre example that Aristotle uses in I.8. Both the meaning of the example and its role in the context of the solution of the Eleatic dilemma have been difficult to determine not only because it asks us to imagine the strange scenario of a dog coming into being from a horse but because it brings in a discussion of the relation of genus to particular which is not anticipated by the context. Many of the difficulties disappear once it is realized that the example of a dog coming into being from a horse should be taken as part of a *contrafactual* statement in a *reductio ad absurdum* argument designed to show the shortcomings of the argument that allows it as a consequence. More specifically, employing this example as a contrafactual illustrates a deficiency of the application of the account of I.7 and the idea of accidental attributes to the Eleatic paradox:

Similarly there can be no coming to be out of what-is or of what-is-not, except by virtue of concurrence. In that way, however, this too can come about, just as if animal came to be out of animal and animal of a particular sort out of animal of a particular sort, for instance dog <out of dog or horse>¹²⁸ out of horse. The dog would come to be, not only out of a particular sort of animal, but out of [the genus] animal; not, however, as animal, for that belongs already. If a particular sort of animal is to come to be, not by virtue of concurrence, it will not be out of animal, and if a particular thing which is, it will not be out of thing [a] thing which is; nor out of [a] thing which is not. (191b27)

¹²⁸ The words in brackets are absent from the surviving manuscripts though the majority of translators opt to supply them because the absence seems to them to make Aristotle's meaning too strange. Ross (1936, 495-6) and even Sachs among others do this. Charlton accepts the emendation but shows how the passage can make sense without it (Charlton 1970, 80-1). The modification appears to be accepted as early as Aquinas.

From this perspective the dog and the horse are homologous in genus so that being an animal comes to be from an animal. In a certain way belonging to the genus animal is incidental to being this particular dog. More properly, *this* dog comes to be from an embryo (or its parents) but not from the mere fact that its parents belong to the genus animal. If it is sufficient that the parents are members of the genus animal it might in fact be possible that a horse (or any being of the same genus) could give birth to a dog. If this were the case, a dog could indeed come to be from what-is insofar as it happens to come to be this particular animal from something that is also in the *genus* animal. The bizarre example shows the accidental relation of genus to particular in the process of generation and illustrates how at the level of genus it is possible that what-is comes to be accidentally from what-is, thus accounting for one horn of the Eleatic dilemma. That is, what comes to be can come to be from what-is insofar as things are considered not as individual beings but in terms of the genus to which they belong.

At the same time this strange example demonstrates the limitations of the appeal to accidental attributes and hence also the limitations of the three-principled account of generation from I.7. For if we allow that substantial generation can occur by concurrence, this would allow for the logical possibility that dogs come to be from horses if we consider them solely from the point of view of their relation to the same genus animal. This is tantamount to allowing that anything could come from anything as long as they happen to be in the same genus. If a dog came to be from a horse, why not an apple from an orange or anything else? This clearly goes against our normal experience of the world as

well as Aristotle's (as yet unsupported) claim that change does not happen at random (I.5 188a31). This earlier passage even intimates that incidental changes may not be natural changes at all:¹²⁹

But it must be understood first about all beings that none either acts by nature at random or is acted upon by any random thing, nor does anything at all come into being by change from any chance thing, unless one takes what happens incidentally. (188a31)

So even if the Eleatic dilemma is solved in the case of what changes incidentally, this does not tell us enough to be confident that natural or any non-accidental change is not still subject to the Eleatic paradox.

v An Alternate Solution

Aristotle hints that there is another way of addressing the Eleatic paradox: "That is one way of handling the matter; another is to point out that the same things may be spoken of either as in potency or in act. That, however, is dealt with in greater detail elsewhere" (19128-30).¹³⁰ Such an analysis would

¹²⁹ This is further supported by evidence from the arguments from *Physics* II that try to establish the priority of natural teleological changes over things that happen by chance (see especially *Physics* II.8).

¹³⁰ Menn takes this alternate approach to the solution of the Eleatic *aporia* quite seriously: "Indeed, Aristotle uses the actuality-potentiality distinction to secure the very possibility of a science of physics, by explaining the possibility of coming-to-be, and resolving the contradictions that Plato, following the Eleatics and Sophists, had detected in changeable things. Those who think that 'contradictories and contraries occur simultaneously', Aristotle says, 'have come to this opinion from the sensibles, for they see that contraries come-to-be out of the same thing: so if it is not possible for what is not to come-to-be, the pre-existing thing was both' (*Metaphysics* 1009a22-26)" (Menn 1994, 73). Menn thinks that by maintaining the possibility that contraries can be present in a substance *in potentiality*, Aristotle is able to avert the central paradox of change. However, even if this can be regarded as a solution, it is only partial in that it applies only to changes which involve contraries and which therefore excludes substantial generation. If Aristotle offers an elaborate solution to the paradox of coming into being

seemingly apply equally to the doctor healing (or failing to heal) or losing (or acquiring) the medical art and the seed becoming a mature living thing in addition to all sorts of accidental changes. Potency and act may also describe better than the substrate/accident account what actually happens in the generation of a mature living thing from a seed.¹³¹ Kelsey claims that,

[T]his second solution is also essential to any full resolution of the difficulties the problem [i.e. the Eleatic paradox] raises for Aristotle. Recall that Aristotle's first solution concedes that the conditions which the problem places on what substances come from, though they do not constrain what they can come from incidentally, really do constrain what they can come from unqualifiedly. Given this, Aristotle must think that there is some way to reconcile these conditions; otherwise there would not be anything that substances come to be from unqualifiedly, in which case they simply would not come to be at all. (This is the idea that what holds "incidentally" is parasitic on what holds "unqualifiedly" or "per se," for which see for example *Phys.* II.3, 198a8-9). So, Aristotle must find something that meets both conditions, if he wants to settle fully and completely the difficulties the problem raises. (Kelsey 2006, 349)

But if the account in terms of potency and act is sufficient to fill the gap for non-accidental changes (i.e. *per se* or substantial changes) why is it not capable of accounting for accidental changes as well? If the account of generation in terms

from not-being in substantial generation, it is not in the *Metaphysics* passages to which Menn refers. Menn appears overenthusiastic in his claim that these passages 'secure the very possibility of a science of physics'.

¹³¹ If one is uncomfortable with the idea that Aristotle would employ his ideas of potency and act this early in the *Physics* (or in the *Physics* at all), it must be pointed out that these notions offer much more leverage than the idea of accidental attributes in addressing the fact that *Aristotle reinterprets the Eleatic paradox about beings into a discussion about acting and suffering* (ποιεῖν and πάσκειν), a feature that is universally unaccounted for in the literature. With this in mind we can account for the role of the ideas of potency and act and at the same time account for this detail of Aristotle's argument. Potency and act are employed throughout the *Physics* but are never treated thematically. Even though the thematic treatment of potency and act are subjects belonging to first philosophy, this does not inhibit Aristotle from employing these concepts in the service of physical inquiry.

of accidental change is parasitic on an understanding of *per se* change, why is the account in terms of accidental change even necessary?

Further questions remain: first, if such an account in terms of potency and act would be helpful in showing how one can avoid the Parmenidean paradox as it relates to substantial generation, why would Aristotle not include a full version of it here? Considering that the account by way of the accidental relation of contrary to substrate is insufficient with regard to substantial generation, why would he hold back from an explanation that might be more helpful? Why not simply give the account of potency and act in the first place if it might hold more promise of resolving the problem for all of the phenomena and not just some? Second, why would he say at the beginning of the chapter that this is the “*only way*” (i.e. the way of the *per accidens* account in line with I.7) to resolve the paradox and less than a hundred lines later claim that there is another way available?¹³² Once a full account of generation in terms of potency and act is given in which generation *per se* could be sufficiently defended against the Eleatic paradox, there would be no need for a separate account of generation *per accidens* and *a fortiori* no need for the account found in I.7. This is of course not true the other way around. An account of *per accidens* generation would not be sufficient in itself to account for all generation.

In I.8 Aristotle set himself the task of overcoming the Eleatic paradox of generation. We have seen that his approach is not entirely straightforward. It

¹³² This supposes that an account of generation in terms of potency and act is not just a trumped up version of the account in terms of contraries (Cf. Bolotin 1998, 14-15, 20, and 26n5).

should also be sufficiently clear that there is at least some doubt as to whether he has actually provided a comprehensive solution to the problem of the intelligibility of generation. While I.8 and I.7 together can account for the possibility of accidental generation, *per se* generation does not seem to have been adequately addressed. Unless we claim that all generation is of the accidental variety, a claim which he almost seems to admit at one point (191b17), we should still be expecting something more to show how substantial generation can be defended against the Eleatic claim of unintelligibility. And while the account of generation in terms of potency and act seems to hold promise in this regard, it remains unclear whether it can address the Eleatic dilemma without begging the question. If there is still some doubt about whether Aristotle has succeeded in providing an adequate argument against the Eleatics, this further calls into question the success of *Physics* I as a defense of the project of natural science. That Aristotle has had at least some rhetorical success in defeating the Eleatics and establishing the legitimacy of physical inquiry is not in doubt. The account of change in I.7 explains enough and is compelling enough to provide at least some satisfaction that the inquiry into nature is both worthwhile and fruitful. But strictly speaking we have not received a rigorous and comprehensive defense of natural science and the intelligibility of substantial generation.

Chapter 3

Nature loves to hide.
-Heraclitus

Privation and Potentiality

3.1 Nature as Form and Privation

There are several places where the subject of substantial change comes to the foreground in the *Physics*. The first and most detailed, though in some sense still preliminary, is in the later chapters of book one. The theme of substantial generation returns almost immediately in book two albeit only by its conspicuous absence. The last lines of book one promised a second start in the investigation into the principles of nature.¹³³ We find this second start in the opening lines of book two which initiates the investigation proper into nature:

Of the things that are, some are by nature, others through other causes: by nature are animals and their parts, plants and the simple bodies such as earth, fire, air and water (for these things and such things we say to be by nature), and all of them obviously differ from the things not put together by nature. For each of these has in itself

¹³³ “That, then, there are starting points, and what they are, and how many in number, let it have been marked out in this way for us, but starting over from another place, let us speak in a different way” (192b1-3).

a source of motion and rest, either in place, or by increase and decrease, or by alteration. (192b8-18)

The first definition of nature given here limits the scope of the class of what exists by nature by excluding what does not exist by nature; it isolates a region of the things that are. What exists by nature is divided off from what exists “through other causes.” Subsequently what exists by nature is contrasted with not only what exists through art but also what happens through chance and necessity (*Physics* II.4-9). Animals, their parts, plants and the simple bodies evidently have a principle within them that accounts for the motions they exhibit. But what sorts of motions are these? The list he gives us here appears to be incomplete if we are expecting the canonical four types of Aristotelian change (alteration, locomotion, growth, and substantial generation). Each of these sorts of things, Aristotle tells us here, contains within it its own source of movement in place, growth and decay, and alteration. Now if we are not to subsume substantial generation within the class of alteration or growth, there seems to be an important omission.¹³⁴ This omission is conspicuous in that the examples given seem to be the prime examples of what might come to be simply. Animals and plants are born, the parts of animals come to be in the generation of an animal, and the simple bodies or so-called elements are generated from one another.

The kinds of changes Aristotle lists here as natural can all be understood as accidental to the essence of the thing that moves in such a way in that they do

¹³⁴ Charlton (1970, 88) supposes that Aristotle means to include “not only movement [local motion], but change in general ([193]b14-15) such as, no doubt, the formation of the organic parts and teeth.” If Charlton is thinking of such changes as generation in the simple sense, he is missing the import of the omission of substantial change from the list: namely that it will be the central problematic case of “what exists by nature” in the *Physics*.

not change the essence of the thing. For change in place, size, or quality need not be changes with respect to the kind of thing it is (cf. 226a26).¹³⁵ If an animal changes its place under its own power, this does not affect its being this particular kind of animal; nor would an animal (necessarily) be changed with respect to its essence if it gained or lost weight or became cold or a different color. Though the source of any of these changes might be found within the animal, it need not change its essence. Why then does Aristotle not include substantial generation with the kinds of motions which make evident that some beings exist by nature having in themselves the principle of their motion? For having determined that there are such things that exist by nature (albeit only by means of an appeal to common sense), Aristotle seeks next to determine whether nature applies more to material or to form.¹³⁶ Finding that nature is more properly spoken of as form (193a30 ff. and especially 193b8), Aristotle must consider in what way this applies to the generation of substances. The result is that the determination of substantial generation as a natural change will depend on how we are to understand the meaning of “privation,” as opposite to and a “sort of” form in the case of substantial generation.

The argument meant to establish which of the two ways that nature is spoken of more properly characterizes nature is as follows: “In one way then,

¹³⁵ “Now let motion with respect to of-what-kind be alteration, for it has been joined with this common name. But I mean by the of-what-kind not what is present in an independent thing (since then even the specific difference would be a quality), but what is attributive, as a result of which a thing is said to be acted upon or unaffected” (226a26). Compare *Categories* 2.

¹³⁶ On the evidence of the distinction between what exists by nature and what does not and whether there is nature at all, see Broadie (1982, 48-58 ff.).

nature is spoken of thus, as the first material underlying each of the things that have in themselves a source of motion and change, but in another way as the form, or the look that is disclosed in speech” (193a29-31). The material is nature in a way, as Antiphon argues, in that “if someone were to bury a bed, and what rotted had the power to put up a sprout, it would not become a bed but wood” (193a13-15).¹³⁷ Aristotle would seem to agree with Antiphon to the degree that we might say that a product of art has a nature (*vis à vis* the nature of the material it is made of). This would mean that it contains a principle of motion in itself, not *qua* work of art, but *qua* that out of which it is made, e.g. something made of stone or earth will have in itself an impulse to move downwards (192b20 ff.). The material in a way is nature since material does have in itself a source of motion.

Material does not, however, exhaust what it means to be by nature for it is not merely the unorganized material that accounts for the movement of natural things but more specifically that toward which they move, i.e. the form or the “look disclosed in speech” (193a31). The argument that establishes that form is more importantly nature than the material depends on the priority of what exists in act over what exists merely in potency (193a33 ff., cf. *Metaphysics* IX.1-3). Drawing an analogy from the realm of art, Aristotle reminds us that we do not say that something exists according to art “if it is only potentially a bed and does not yet have the look of a bed” (193a33). Likewise, “what is potentially flesh or bone does not yet have its own nature, until it takes on the look disclosed in speech, that by which we define when we say what flesh or bone is, and not until

¹³⁷ For a full discussion of Aristotle’s treatment of his “materialist” opponents in the present discussion of nature, see Broadie (1982, 55-59 and 66 ff.).

then is it by nature” (193b1-3). Thus even the material is not properly the nature of a thing unless what it is the nature *of* is known before. What the material is the nature *of* is more properly nature than the material is, and this is the form or the definition. Nature then can be spoken of as both material and form, but nature as form is prior and material nature derives its determination as natural from its relative form.

Aristotle asks us to consider whether there is another sense in which something comes to be by nature. For not only does the human being come from flesh, and hence from the material, but the human being comes about from another human being (193b9-10).¹³⁸ That is, form comes from form in such a way that Antiphon is misguided in thinking that from a wooden bed wood would sprout. Rather, if anything were to sprout from a buried bed it would be the same *in form* as whatever the parent was. It is not the material “wood” that would come to be, but rather some *kind* of wood, e.g. pine or oak.¹³⁹ Again, the form has priority since the material is never undifferentiated but is of a certain kind (i.e. has a particular and differentiated form). If the material of a bed were somehow to grow, it would not yield another bed nor would it yield undifferentiated “wood” as Antiphon seems to claim according to Aristotle, but rather it would yield kind of tree from which the wood was taken.

¹³⁸ We will have to consider in another place the implications of the use of this ‘man from man’ formulation in contrast to his other way of speaking about ‘man from seed’ (here and in *Parts of Animals*) in a discussion of the special problem of spontaneous generation.

¹³⁹ Cf. Sachs (1995, 24) and Broadie (1982, 62-63).

After Aristotle has established the priority of form and its rightful claim to the title of nature, he turns for the first time to an explicit consideration of nature that concerns substantial generation. This consideration is not only meant to confirm the result of the previous arguments that nature is form but to raise an *aporia* about the character of form and that-from-which form arises. As we have seen, in this chapter Aristotle uses two different models of that-from-which a form comes to be: (1) from the material as in the example of flesh and bone, and (2) from a prior form as in the example of a human being coming from a human being.¹⁴⁰ The question arises as to whether, when something comes to be by nature, what grows is that from-which or that to-which it grows. Namely, is that which grows more properly the embryo or the man, or even the flesh and bone or the man. Aristotle claims that what grows is that to which the change is aimed, e.g. the fully formed human being, even if this seems to run contrary to common sense. But in the case of substantial generation determining that-from-which a substance comes to be is difficult insofar as it appears to come from “what-is-not,” “not-being” (cf. *Generation and Corruption* I.3). The *aporia* has precisely to do with the way of speaking about nature as coming-to-be that he contrasts with the way a τέχνη relates to what it produces. Let us look at how he contrasts nature and art and the *aporia* this presents to the correct understanding of nature in the sense of substantial generation:

¹⁴⁰ But this phrase “man from man” may even be ambiguous, for it could either mean this man comes to be in virtue of parent who is also a man or this man comes to be a man insofar as he was already a man in potentially a man (an actual man comes to be from a potential man).

The nature spoken of as coming into being is *a way into nature*. For it is not like the process of medicine, which is meant to be a road not into the medical art but into health, for it is not necessary that the medical process be from the medical art and not into it. But not thus is nature related to nature, but the thing being born [φύομενον], insofar as it grows [φύεται], does proceed from something into something. What then is it that grows? Not that from-which, but that to-which. Therefore nature is the form. But form and nature are meant in two ways, for deprivation [στέρησις] is a sort of form. But whether in the case of a simple coming-into-being there is or is not a deprivation and an opposite, must be looked into later. (193b14)

Since nature is more properly form than matter and what something changes into is its form, it makes more sense say that nature is that-to-which something changes in a natural change. To illustrate Aristotle proposes a disanalogy between nature and art. Unlike the medical art in which the application yields something aside from itself (the aim of the medical art is not the production of the medical art but rather the production of health in a patient) and since what results is not the medical art but what is *from* the medical art, i.e. health in the patient. Nature differs in that it is not that-from-which something else comes to be but rather that to which it comes to be. Movement to form according to nature in the case of “being born” [φύεται] is not the result either of the matter or some external cause, like τέχνη, but the result of the form immanent in the thing moved. Even more is this the case in substantial generation. For what is born (φύομενον) contains within itself the principle of what it grows into. What comes to be by nature comes to be out of nature and into nature. Thus, unlike the medical art, nature achieves and promotes itself when coming into being. But since nature comes to be from itself into itself, which is it that more properly should be said to grow, that-from-which or that-into-which it grows? Following

the results of the previous arguments, what grows is the nature into which what grows grows so that nature is, again, fully developed form.¹⁴¹

Yet what exactly is nature in the sense of that from-which in the case of substantial generation? Is it from flesh and bone that the fully formed human being comes to be? Is this nature in the sense of form or material? It would appear that it is nature as material from which the fully formed substance comes to be, the material being the privative state of the form of that which is to come to be. Yet Aristotle, in the last lines of the chapter says that form is meant in another way insofar as “privation is a sort of form” (193b20). Whether or not “in the case of a simple coming-into-being” (193b21) there is deprivation at all remains questionable. From the two ways of understanding that from which something comes to be (from material and from previous form), he presents us with the difficulty of understanding how either of these might be considered a deprivation in the sense of an opposite. This is the fundamental problem in

¹⁴¹ Broadie surmises from this passage that there is some discrepancy between the sense of φύσις as internal principle of change and φύσις as what arises out of φύεται (namely, form). “Despite the close dependence just exhibited between nature as principle of change, and the developed structure [form], Aristotle exceeds his warrant in concluding that the form is the latter, since by the very terms of the argument, the latter is the *result* of the former, and is not always actually present at the same time” (Broadie 1982, 65). Here she detects the principle difficulty surrounding Aristotle’s conception of form: “How can what something is to be, which is necessarily not yet, *be* what brings about the present process towards what is to be?” (Broadie 1982, 65). Cf. also Charlton, “His point is that φύσις in the sense in which it is used for a process, i.e. in the sense of birth, is φύσις of the form, e.g. a man, not the matter, e.g. menses. Alternatively, as most commentators suppose, he is making a play with the fact that φύσις comes from a verb which in the passive means ‘to be born’ or ‘to grow’ (cf. Latin *natura*). Suggesting, then, that φύσις might be used for a process, sc. growth (or perhaps simply – the text is ambiguous – for coming to be), he says that nature ought to be what this process is a process towards, not what it is a process from, and what it is a process towards is the form. Exactly why the process should not proceed from nature, as doctoring proceeds from knowledge of medicine, is unclear” (1970, 91). Cf. also Philoponus (1995, 29-31).

making intelligible the phenomenon of substantial generation; a problem the solution to which he again postpones.

Since in the case of coming into being simply the from-which is the deprivation, it must be understood in what sense that which lacks the substantial form might contain in advance that form to which it will come to be. If it is a “lack” or “non-being” simply it would seem to contain no nature at all. How can what-is-not simply have any characteristics at all? It might be objected that for Aristotle, since the privation is always a determinate lack, such a determinate lack is precisely what contains the nature *as absent*. But if he had considered the issue settled in the case of substantial generation there would be no reason to raise the *aporia* he raises here. What must be understood is in what way deprivation as a determinate lack can be applied to the case of substantial generation and in what sense the privation in this case may or may not be an opposite. This question he tells us “must be looked into later” and it is generally supposed that argument he is referring to is found in book five.

3.2 Differentiation of Μεταβολή and Κίνησης

The arguments in book five come to a perhaps disconcerting conclusion about substantial generation. For here Aristotle concludes that of the four primary kinds of change (generation, alteration, locomotion, and growth), generation ought not be considered a motion (κίνησης) in the strict sense of the word. Aristotle makes this exclusion refining the definition of motion from book three. There generation was indiscriminately included in the things contained by

such a definition (200b34); we will have to see if this inclusion still holds after the exclusion of generation in book five. Aristotle clarifies and narrows the term κίνησης which he had first formally treated in book three by distinguishing motion (κίνησης) from change in the wider sense (μεταβολή) according to the sorts of oppositions that are appropriate to them and the nature of the substrate involved.

Any change can be described in one of four ways: there are those things that change (1) from a subject to another subject, (2) from what is a subject to what is not a subject, (3) from what is not a subject, and (4) from what is not a subject to what is not a subject (225a1 ff.). As the fourth possibility does not correspond with any phenomenon “there being no antithesis” (for there are “neither contraries or contradictories” between what-is-not and what-is-not, 225a11), it is excluded even from the class of μεταβολή. Cases (2) and (3) (as the corresponding concepts of destruction and generation respectively) are then excluded from the class of κίνησης but retained in the class of μεταβολή. Only (1) properly fits in the category of κίνησης in the proper sense. What distinguishes (1) from (2) and (3) is the character of opposition present in each as well as the role of the substrate.

Having distinguished the different character of the oppositions involved in change, Aristotle goes on to show why change between contradictories cannot be motion in the strict sense. What is in motion must *be* in some way, and not incidentally (225a25), and the negative side of a pair of contradictories is not capable of being moved. Aristotle first distinguishes between the generation of some particular thing and the generation of something simply. What comes to be

some particular thing is like the change from “not-white to white” (225a17) where the not-white designates anything other than the white (including things like six feet tall or hairless or any opposition that is not a contrary or a privation within a single genus). What comes to be simply, on the other hand, comes from “not-being simply, into *ousia*, [and we do not mean] that it becomes something” (225a18). Likewise destruction acts in the opposite way, from being white to not-white in the way specified and from being a substance to “not-being” simply. What is the meaning of “not-being” in relation to substance and its contradictory, however, needs clarification. Aristotle clarifies this notion by means of an examination of the diverse meaning of “what is not” (225a22) and here we have his most explicit reference to the *aporia* from II.1:

*If “what is not” is meant in more than one way, and that which results from combination or separation does not admit of being moved, nor does that by way of potentiality, the opposite of what simply is by way of activity (for the not-white or not-good nevertheless admits of being moved incidentally, since what-is-not white could be a human being, but what simply is not a *this* in no way admits of it), then it is impossible that what-is-not be moved. (And if this is so, it is also impossible for coming into being to be a motion, for what passes into being is what is not. For however much it becomes incidentally, it is still true to say that not-being belongs to what comes into being simply.) And it is likewise impossible that what-is-not be at rest. These *inconvenient results* also follow if everything that is moved is in a place, since what-is-not is not in a place, for then it would be somewhere. (225a22-32)*

Aristotle’s argument employs the distinction he had made in I.8 between what comes to be out of what-is-not incidentally and what comes to be out of what is not as such or simply. Here he uses the distinction to show that in neither case can what-is-not be in motion. The conclusion he draws from this is that if generation is thought of as either coming from what-is-not accidentally (the not-

white) or what-is-not simply (what is not a substance), such a thing could not be moved. Since “what passes into being is what-is-not,” and generation is from what is not, such a thing is not movable and generation therefore could not be a motion in the proper sense.

Only what-is can be moved, and what it is that is moved is substrate. For this reason Aristotle can further refine the distinction between change and motion on the grounds that “every change [μεταβολή] is *from* something *to* something” (225a1) while “motion [κίνησις] must be *of* something, *from* something, *to* something” (226a13). The differentiation between change and motion rests on the inclusion or exclusion of the substrate in the definition. In the case of generation, only that from-which and that to-which are identifiable (from not-being simply to being a substance). Motions in the strict sense are *of* things that already are while changes in general are from what-is-not to what-is. It would make no sense to say the generation is the generation *of* what-is-not in addition to contradicting the conclusion of II.1 that what comes-to-be is the end of the change, not the beginning.

What then is the solution to the *aporia* concerning whether or not there is an opposition or deprivation of substance presented at the end of II.1? Because substances do not have contraries but only contradictories, the privation is not a privation in something but privation simply. But privation appears to be nothing at all or if contradictories among substances are similar to contradictories with respect to qualities (the not-white and the white), there would seem to be no identifiable connection between the contradictories (compare *Physics* I.5).

What Aristotle has achieved is to bring the *aporia* concerning generation to a higher level difficulty that begins to reveal in more detail what exactly is at stake in determining the sense of privation with regard to substance. For as it turned out, if there is a privation or opposition involved in substantial generation, it is of a sort that would disqualify it from being a motion in the proper sense. The consequence of this could be severe. For now we are left with the question of whether or not and how the phenomenon of generation is commensurable with the definitions of motion in book III.¹⁴² If the definition of motion cannot capture the essence of substantial generation, then it would appear that substantial change might not be in the strictest sense a subject of physics.

3.3 Substrate and Potentiality in Elemental Transformation

Aristotle's doctrine of the generation of the four elements out of one another is deeply connected with his account of substantial change. Though at times it is unclear whether Aristotle considers the elements themselves to be full-fledged substances, his account in *Generation and Corruption*¹⁴³ is meant to be an inquiry into the nature of "causes and definitions of generation and corruption common to *all* those things which come to be and perish in the course of nature" (314a1, cf. Burnyeat 2004, 7). Despite the supposed generality of the treatise, *GC* for the most part treats the problems surrounding generation by means of an

¹⁴² This parallels the conclusion from *Physics* II.1 that there is some question as to whether or not "nature" and substantial generation are compatible.

¹⁴³ *On Generation and Corruption* is from here on abbreviated *GC*.

analysis of the elements, how they transform into one another, what is the cause of their perpetual becoming, and what their transformative and constitutive role in mixtures is.

The central issue relating substantial generation and the transformation of the elements concerns the nature of the substrate or ὑποκείμενον involved. Aristotle's treatment and employment of the notion of the ὑποκείμενον in *GC* in particular has been the focus of a long standing debate between the two prevailing interpretations of Aristotle's doctrine of material cause because it seemingly provides textual evidence supporting both points of view, namely the Prime Matter and Functional Matter interpretations.¹⁴⁴ The reason for the ongoing dispute between two prevailing interpretations of the doctrine of material cause in the case of simple generation may be that in fact Aristotle does not offer only a single account of generation and its material cause. This is not a fault of Aristotle and we should not chalk up apparent inconsistencies to carelessness or short sightedness on Aristotle's part. Rather, it may be because of the very difficulty and perhaps insolubility of the problems at hand as well as Aristotle's own recognition of this that *GC* seems to lead in opposing directions.¹⁴⁵ We will examine the merits and deficiencies of each of these

¹⁴⁴ Aquinas is a model proponent of the Prime Matter view while, while among modern commentators Mary Louise Gill is a good representative of the Functional Matter camp (cf. Gill 1989).

¹⁴⁵ Bostock perhaps more clearly than other commentators acknowledges these radical inconsistencies in *GC* with its apparent simultaneous endorsement and disavowal of the notion of prime matter. However, he finds that this inconsistency is due to carelessness and a series of fundamental mistakes made by Aristotle (Bostock 1995). While Bostock's analysis of the doctrines in *GC* is for the most part correct, I believe he has underestimated Aristotle in thinking that he has seen very obvious contradictions which Aristotle must have overlooked.

interpretations of Aristotle's doctrine of material cause specifically in relation to his arguments establishing both the character of simple generation and its existence in nature.

On Generation and Corruption pays special attention to the phenomenon of elemental change because it represents in some way the limit case of sublunary change. Because of this peculiar difficulties become visible which are less apparent in the case of higher level instances of generation. In particular the question of the nature and role of the substrate in simple generation is most clear at the level of elemental change because the normal strategies of identifying the form and matter in a given change become difficult to employ. For example, a typically Aristotelian way to identify the principles of change is to look for the forms or contraries which limit a given change and then to find the substrate which lies below the level of those forms, which provides a substrate for the change. This substrate can be similarly analyzed into form and matter and so on until we reach the level of the elements at which the analysis must theoretically end.

For example, the process by which an unmolded piece of bronze becomes a statue is analyzable into the forms "unmolded" and "shaped-statue" the matter of which is bronze. In turn, the bronze itself is subject to a similar analysis. The bronze itself can be understood as a composite of positive attributes which have come to be and materials that underlie this change, namely the attributes of orangish color, malleability, etc., and the materials out of which this bronze comes to be, namely the homoeomers tin and copper. Even further, the tin and copper can be analyzed further into the elements out of which they are

constituted, namely Earth and Water. At this point, we presumably reach the end of this type of analysis. That is, because Earth and Water are the ultimate constituents of bodies (cf. *De Caelo* III.3), there can be no further material that underlies the attributes they exhibit.¹⁴⁶ How then are we to account for the phenomenon of elemental change if we cannot do so by the same sort of analysis that was employed at higher levels? It is at this stage that we confront the difficulty of considering Aristotle's claim that these elements transform into one another and what *ὑποκείμενον* underlies this change (if anything) while remaining "simple bodies."

The heart of the difficulty regarding the *ὑποκείμενον* is that whereas it is relatively easy to identify a something which persists throughout higher level changes, in the case of the transformation of elements in which the elements change "as a whole" (317a22 and 319b15) it is difficult to identify by means of perception (318b19-27) what persists and makes the change continuous. This question of continuity is critical in that it seems to be required to make the change intelligible, and it is unclear whether Aristotle ever specifically claims that elemental transformation as such are continuous. Rather, he often says that

¹⁴⁶ This is not precisely the way Aristotle designates the elemental bodies as simple. He does so rather by an appeal to the *simple motions* they naturally exhibit (cf. *De Caelo* 268b27, 276b8 et al.). Compound motions indicate compound bodies, and simple motions indicate simple bodies. A definition of element that Aristotle claims to share with the majority is "a body into which other bodies may be analyzed" (*De Caelo* 302a16) and presumably which cannot be analyzed any further into bodies of another kind. The elements are analytically complex in that they always exhibit a "yoke" of two qualities (hot-wet, cold-dry, etc.). This however is not complexity of matter and form, since both sides of the yoke are contraries and, as it were, forms in some basic or derivative sense. It is also worth noting that the characteristics that determine the distinction between the simple bodies by virtue of the nature of their motions are not the primary contraries that "make up" the elements themselves. Cf. Gill (1989, 67).

there is no “intermediate” between the elements and that the cycle of generation among the elements is stepwise (331b4-11).¹⁴⁷ This leaves at least the possibility that elemental transformation is a sheer replacement of one element by another or that when one element perishes another “pops” into being.

GC attempts to address this question by clarifying the distinction between alteration and simple generation, and whether there is such a distinction in nature to begin with. On Aristotle’s account, elemental change is different from change at higher levels (e.g. unmolded bronze becoming a bronze statue) not only on a quantitative scale or scale of perspective, but also qualitatively. If a distinction is made between simple generation (a transformation in which the subject changes “as a whole” as in the case of the elements (317a20)) and alteration (in which only an attribute of a subject is changed and where the subject remains intact (317a25)) several questions arise as a consequence, the central one concerning the nature of the material substrate involved. Does the substrate in each these distinct processes play the same role, and are they even conceptually the same? Because Aristotle’s analysis of elemental generation seems to answer these questions in different ways, the two main lines of the interpretation of Aristotle’s general theory of matter meet head on.

Before Aristotle discusses at length the difference between alteration and generation in the *Generation and Corruption*, he tells us that there are two kinds

¹⁴⁷ The easiest way for the elements to transform is to transform into an “adjacent” element, i.e. an element that shares one of its contraries. Fire which is hot-dry can easily transform into air which is hot-wet. Fire can transform into water or earth as well but it is “more difficult [and takes longer] because there is a change of more [factors]” (331b1, Gill’s translation (1989, 70)). Cf. Gill (1989, 70-5) for a more detailed treatment of the issue.

of generation: qualified or partial generation (317b35) and unqualified or simple generation. To the latter belongs the transformation of the elements into one another as well as the generation of substances (319a16). To the former belong alteration, locomotion, growth, and the other derivative sorts of changes. The task of *GC* I.3 is to determine whether the distinction can be legitimately applied to nature or whether it is a mere artifact of speech.

Generation in either sense means that something comes to be from what-is-not. Something new has arisen which was not there before. If we mean that something came to be from something that existed already, we are talking about qualified or partial generation. It is partial in that there is something identifiable which remains through the change, and qualified in that it is a quality or accident of a being that undergoes change and not the being itself.¹⁴⁸ Generation as a whole or unqualified generation, on the other hand, occurs whenever there is a change in which nothing perceptibly identifiable necessarily remains and when something which exists in its own right, i.e. something substantial, undergoes change. Aristotle also makes this distinction in another way in numerous places as that between the generation of something simply and the generation of something from something (γένεσις τὶς).¹⁴⁹

¹⁴⁸ Joachim notes that “qualified” means that “the basis of *genesis* only is with a qualification, i.e. it *is-δυνάμει*. Τὸ ἀπλως μὴ ὄν means ‘that which is, without qualification, devoid of being’: but τὸ ἀπλῶς μὴ ὄν means “that which is devoid of being, unless you qualify the term ‘being’” (cf. *19a29-b4)” (Joachim 1999, 93). This is not un-Aristotelian *per se*, but it is not clear from the previous passages that Aristotle means to mark anything but the difference between changes in which an only an attribute changes from that in which a thing changes absolutely.

¹⁴⁹ Joachim seems to take this latter distinction as a division only among substantial changes themselves: “The distinction between ἀπλῆ γένεσις and γένεσις ἢ κατὰ μέρος

The question in *GC* I.3 is whether this distinction holds in nature (317a32). If there is simple generation in nature and it follows the model of qualified generation which is more easily identifiable in nature, what comes to be in simple generation must come to be from what-is-not simply. Whereas in the case of qualified generation where “something comes to be from being something” (317a34), in the case of simple generation it is necessary that something come to be from “not being *simpliciter*, so that it would be true to say that not-being belongs to some things” (317b1). Aristotle derives this conclusion on the grounds that just as in qualified generation something must come to be from what-is-not in a qualified sense (e.g. the man is not-educated, or not-healthy, etc. and only from this condition can he properly come to be educated, healthy, etc.), in simple generation too, something must come to be from what-is-not.

The traditional interpretation of Aristotle’s theory of generation imputes to him a belief in what was called by the scholastics *prima materia* or Prime Matter. Prime Matter is understood to be the utterly formless, pure potentiality that ultimately underlies all change including elemental transformation. It is thought to persist throughout elemental generation as that in which the contrary qualities that the elements exhibit inhere and that therefore supplies the condition of continuity for such changes. This interpretation has the virtue that it goes a long

(b35) has nothing to do with the distinction between ἀπλῇ γένεσις and τὶς γένεσις (cf. *17a32-34) which is drawn for the first time at 18a27 ff.” (Joachim 1999, 95). But the text he cites directly conflicts with his interpretation if we are to understand the example of the man becoming educated *not* as a case of substantial generation but rather as an alteration or substantial generation which is consistent with Aristotle’s usual use of this illustration: “But *this* “comes-to-be something,” but does not do so without qualification; for we say that the student “comes to be learned,” not “comes to be” without qualification” (318a33 cf. also 317a32 and *Physics* I.7).

way in explaining simple generation on the standard Aristotelian model of change in which any change involves a replacement of contraries in an enduring substrate.

The Prime Matter interpretation finds support in several passages scattered about the Aristotelian corpus.¹⁵⁰ The weightiest textual evidence for Aristotle's belief in prime matter in *GC* is cryptic and ambiguous. Bostock for example cites the following as indicating that Aristotle held such a view:

And is the matter for each of these different? But if that were so, they would not come into being from one another or from opposites. (For it is fire, earth, water, and air to which the opposites belong.) Or is it that in one way it is the same matter and in another it is different? For [that, whatever it is, that underlies] is the same, but its being is not the same. (319a34-b4)¹⁵¹

Bostock fails to appreciate that this statement is one in a series of *aporiai* that Aristotle presents to which he proposes more than a single solution. This passage is not meant to be taken as implying Aristotle's considered view. It remains unclear at the moment which of the alternatives Aristotle endorses. For in the immediate prequel we find:

However, a difficulty might be raised whether this thing which is not *simpliciter* is one of the pair of contraries – earth, the heavy element, for instance, as what-is-not, and fire, the light element, as what-is – or whether, on the contrary, earth too is what-is, whilst what is not is the matter that belongs equally to earth and fire. (319a30-34)

¹⁵⁰ Much of the debate about whether or not Aristotle actually believes in Prime Matter is centered around *Metaphysics* VII.3, *Physics* I.7-9, *GC* I.3-4 and II.5. There is however no explicit or sustained treatment of matter in Aristotle that expounds a full blown theory of prime matter. The phrase *πρώτη ὕλη* only occurs a handful of times in the corpus and only some of these can be even plausibly be read as supporting a theory of prime matter.

¹⁵¹ The translation is Bostock's (Bostock 1995, 221-222). He includes a more accurate and literal translation as an alternative in a footnote (Bostock 1995, 222n7).

Aristotle began the chapter by addressing the Eleatic paradox of change by claiming that something can come into being from what-is-not simply, when what-is-not is understood as a potentiality. The notion of potentiality becomes a sort of place-holder for the notion of not-being. While he shows that supposing this carries difficulties of its own, he does not ever reject it.¹⁵² Further on Aristotle raises the question of which of the elements is more rightly called not-being. If the elements really transform into one another and this change is from not-being *simpliciter* into being, one of the elements should represent not-being (or potentiality) more than the other which would represent the being (or actuality) side of the process.

Aristotle makes some effort to correct the common opinion that what is more perceptible has more being. For example, it was commonly thought that earth has more reality than air because it is more perceptible and tangible (318b27 ff.) whereas in Aristotle's estimation "they are in truth more of a something [μᾶλλον τόδε τι] and form than earth" (318b22). The two points together (that potentiality in some sense holds the place of not-being and that some of the elements have "more being" than others) suggests that Aristotle thinks that earth may be "what-is-not" and fire "what-is" so that the alternative that he poses to this, i.e. the prime matter view, may not be his considered view.¹⁵³

¹⁵² Aristotle also endorses this strategy (employing the concepts of potency and act) for overcoming the Eleatic paradox in *Physics* I.8 even if only tangentially.

¹⁵³ Cf. 318b11 ff.

To be sure that he endorsed such a view one would have to have sufficient grounds for claiming that he ultimately rejects the view that earth that is potentially fire represents the side of not-being while fire represents the side of being. Yet we do not find such sufficient grounds. Rather, what we have is a series of arguments that seem to support the thesis with which he began, namely that the elements come to be out of one another as being comes to be out of not-being or potentiality. This of course does not preclude the Prime Matter interpretation, but also this does not imply the necessity of prime matter either. By providing an alternative to this view in the form of a theory that posits a matter common to the elements (and that leads to the interpretation requiring prime matter), Aristotle need not, and indeed does not, indicate that he holds such a view but offers it as a way one might be able to overcome some difficulties with the potency/act schema he has outlined.

The second major source of evidence for the Prime Matter interpretation relies on a supposed distinction between perceptible and imperceptible matter. In *GC* I.4 where Aristotle takes up the task of distinguishing between generation and alteration, he does so by claiming that even though in both alteration and generation there is something which persists throughout the change, in the former this substrate is perceptible while in the latter it is imperceptible:

It is alteration when the underlying thing remains, being perceptible, but changes in it affections. [...] But when the thing changes as a whole, without anything perceptible remaining as the same underlying thing (for example, when the seed as a whole becomes blood, or water air, or air water), a case of that sort is generation. (319b10-18)¹⁵⁴

¹⁵⁴ On the perceptibility of the substrate see Gill (1989, 48 ff.).

The Prime Matter interpretation assumes that the phrase “without anything perceptible remaining” means “something imperceptible remains,” but the phrase is ambiguous. It could also mean that nothing remains at all, much less something perceptible. Aristotle confirms our suspicion a few lines later when he says that “when nothing remains of which the other [resulting state] is an affection or any other sort of accident, we have generation of one thing and destruction of another” (319b35).¹⁵⁵ What we are left with is one of the conclusions Aristotle drew in *GC* I.3 that served to deal with the possibility that when something perishes it perishes into nothing.

The prime matter interpretation has the virtue that it resolves some of the basic difficulties involved with supposing that the elements come into being from one another as being comes to be from not-being *simpliciter* or from potency. It promises to do this by providing a substrate, which in some sense must be construed as a being, which is present from beginning to end even in elemental generation. However, an increasingly popular line of interpretation of Aristotle’s theory of matter, the Functionalist interpretation, finds vice in this supposed virtue. It is precisely because the Prime Matter interpretation employs the model of change based on Aristotle’s analysis of alteration (cf. *Physics* I.7) in the analysis of simple generation that it risks conflating alteration and simple generation.

¹⁵⁵ There is some confusion among the commentators as to how to interpret this phrase and in general the argument to which it contributes. Cf. Williams (1982, 99 ff.); Gill (1989, 50 ff.); Joachim (1999, 108 ff.).

In order to avoid confusing generation and alteration by making the analogy between the role of the substrate involved in alteration and simple generation too strong, the Functionalist interpretation holds that at each level of analysis, the material aspect of a given change is best understood by means of the *function* that it plays either in the change itself or in the product of the change. That is, the material of any given change is *proximate* to the product which comes to be. For example, the material for the change of a piece of bronze into a statue is of course the bronze, not simply because the statue happens to be made of bronze, but rather because bronze, as a material cause, itself has certain characteristics without which a statue could not be made (e.g. a degree of plasticity which would allow it to be molded but also a certain degree of rigidity which makes the statue capable of standing on its own). The material substrate for any given change then is *relative* to the end toward which the change aims.

Aristotelian matter is not prime matter that holds the potentiality to become all things, rather every instance of matter contains within itself certain characteristics that allow it to undergo only certain kinds of changes and act as the material for certain kinds of beings. Functionalist matter is always already some matter determined in such a way as to be capable of the change that it undergoes. Without specific positive characteristics at least some of which must persist through any change, there would be no change and no identifiable *terminous ad quo*.

For the Functionalist, material is always the material *for* something particular and is itself more or less particular (318b14). However, when confronting the challenge of elemental change, the Functionalist is forced to

admit a strange consequence. Namely, since they are compelled to admit that *something* must survive in the transformation between elements, in lieu of positing prime matter, they are forced to say that one of the positive characteristics or contraries that an element exhibits acts as a persisting substrate, or more precisely that some subject that is not separable from the contrary persists. But even if a contrary/subject survives one step in the cycle of generation, it must be destroyed in the next step, so we really haven't come to grips with the problem but have only pushed it back a notch. For example, when Air (hot and wet) becomes Fire (hot and dry), what remains is the hot and this they claim is the substrate and functional matter of the change. The three principles of the change are thus Air and Fire as the termini and the hot which acts as the persisting substrate of the change. What is typically understood as an attribute of a subject or substrate is forced to play the role of subject or substrate.

Even though both of the above interpretations contain aspects that are compelling, neither I think does justice to the depth of the problem of the Eleatics that Aristotle is trying to articulate. While there is evidence for both points of view in the *GC* and indeed throughout the corpus,¹⁵⁶ each of the theories overestimates what Aristotle thinks he actually achieves. Both suppose that the interpretation they offer can do justice to the Eleatic paradoxes of generation that Aristotle is addressing in the *Generation and Corruption*. Both seriously underestimate the difficulty Aristotle saw in the Eleatic objections. Aristotle was extremely cautious in supposing the paradoxes of change could be definitively

¹⁵⁶ Cf. Williams (appendix, 1982) and Gills (appendix, 1989).

overcome and because of this offered to his readers more than one option in order to deal with the Eleatics. Instead of offering assertions opposing the Eleatic objections to natural science, he offers arguments that allow us to confront the Eleatic difficulties without necessarily completely resolving them.

Both interpretations agree that something must persist throughout every type of change. In alteration, it is clear that something does remain. This is one characteristic that distinguishes alteration from simple generation. In simple generation, however, Aristotle never insists that something must *remain* throughout the change. He says there is always a substrate, but this is not necessarily something that persists and often only designates that from which a change begins (cf. my reading of *Physics* I.7 *supra*). The model of change based on potency and act does not require a persisting substrate but only that a potency be transformed into an actuality.

Even if the potency - actuality model of change may be more suitable for understanding generation, there are serious difficulties involved with it. Aristotle offers us his most powerful concepts to solve the paradox of thinking that in some way “not-being can be predicated of some subjects,” however he proceeds to show us the difficulty involved with supposing that potency can be equated with not-being:

For, if there is coming-to-be without qualification, something must come-to-be out of not-being without qualification, so that it would be true to say that there are things of which “not-being” can be predicated; for some kind of coming-to-be proceeds from some kind of not-being, for example, from “not-white” and “not-beautiful,” but unqualified coming-to-be proceeds from unqualified not-being. But even when these distinctions have been made, there remains a question of remarkable difficulty, which we must take up once again, namely, how is coming to be *simpliciter* possible,

whether from what is potentially or some other way. One might as well wonder whether there is coming to be of substance and the individual, as opposed to quality, quantity, and place (and the same question arises in the case of ceasing to be). For if something comes to be, clearly there will exist potentially, not actually, some substance from which the coming to be will arise and into which that which ceases to be has to change. Now will any of the others belong to this actually? What I mean is this: Will that which is only potentially individual and existent, but neither individual nor existent *simpliciter*, have any quality, quantity, or place? If it has none of these, but all of them potentially, that which in this sense is not will consequently be separable, and further, the principle and perpetual fear of the early philosophers will be realized, namely, the coming to be of something from nothing previously existing. But if being individual and a substance are not going to belong to it while some of the other things we have mentioned are, the affections will, as we have remarked, be separable from the substances. (317b2)

It is one thing to assert that change can take place by virtue of a potency. It is another to be able to explain exactly what potency or potentiality is in its own right. Simply by calling not-being potentiality, we are not freed from the question of the character of not-being though we may be a step closer to making it intelligible.

In order to explore the question of the nature of potency and not-being in the context of the question of the intelligibility of change, it will be of great help to see how the concept of potency and act operates in Aristotle's definition of motion. It is not an accident that the definition of motion is framed in terms of potency and act and that there is some question as to whether generation *simpliciter* (substantial generation) can be subsumed under this definition. In the following chapter, I will investigate the role of potency in the definition of motion with the aim of determining whether or not substantial generation can be included in the kinds of change covered by Aristotle's definition of motion in *Physics* III. This will first require a clarification, motivated by the above passage

from *GC*, on the nature of the potency involved substantial generation that we find in *Physics* II.1.

Chapter 4

Substantial Generation and the Definition of Motion

What more exquisite jargon could the wit of man invent than this definition? – “The act of a being in power, as far forth as in power;” which would puzzle any rational man, to whom it was not already known by its famous absurdity, to guess what word it could ever be supposed to be the explication of.

John Locke, *Essay Concerning Human Understanding* Book III
ch. 4.8

Our Cartesian heritage easily allows us to forget why a definition of motion might be important. It has become unclear why we even ought to regard the meaning of motion as anything but self-evident. Indeed, almost no practicing scientist feels compelled to undertake an effort to understand what the word motion actually means. The modern scientist is content to know *that* motion is without feeling the necessity of knowing *what* it is. Such an account of ‘what’ motion is might not even be considered to belong to ‘science’ but rather to the ‘speculations of philosophy.’ We ought to remember that this distinction

between philosophy and science is a modern one; for the Ancients this kind of distinction is less clear cut. This raises a question as to whether modern science has lost the sense of its original goal. If modern science renounces an obligation to understand those concepts and realities it inevitably presupposes, the meaning of modern science exposes itself to the danger of being lost.¹⁵⁷ These observations alone provide plausible motivation for investigating and taking seriously Aristotle's definition of motion. However, our main concern at present is more modest. What we are interested in exploring in the following is the narrower question concerning the relationship between the definition of motion and substantial generation. But first we must begin by making some effort to understand Aristotle's definition of motion.

Since Aristotle has shown in *Physics* V that substantial generation is not properly a κίνησις, the question remains whether or not substantial generation is compatible with the definitions of motion in book III. That is, there is a question as to whether the definition of motion is general enough to encompass

¹⁵⁷ Cf. Husserl's *Crisis of the European Sciences* (1970, 14-16) and the essays *The Origin of Geometry* and *The Vienna Lecture* in the same volume. Husserl argues that there is a significant break with the premodern conception of philosophy (the tradition stemming from the ancient Greeks continuing into Medieval philosophy) with the rise of the modern sciences which eclipses the original methods and goals of the philosophy and science of the premoderns. Heidegger in contrast rejects the idea of the discontinuity of the tradition of philosophy on the grounds of his analysis of the relation between the Greek conceptions of art and nature which he thinks demonstrates a fundamental similarity between the Greek concept of τέχνη and the modern idea of technology (cf. Heidegger's "The Question Concerning Technology" (1993, 318-320). For Heidegger, the destiny of Greek philosophy culminates with the success of the modern technological sciences. Heidegger formulated this understanding of the trajectory of western thought as early as 1926 in the opening remarks to his lecture course entitled *Basic Concepts of Ancient Philosophy*: "Aim [of the course]: a penetrating understanding of the basic scientific concepts, ones which not only have determined – decisively determined – all subsequent philosophy but which have also made possible Western science as a whole and today still provide that science its foundations" (Heidegger 2008, 1).

substantial generation despite the exclusion in book V. What is at stake in establishing the commensurability between substantial generation and the definition of motion is precisely whether or not knowledge of substantial generation is possible within the scope of the science of nature: “Since nature is a source of motion and of change, and our pursuit is for nature, we must not let what motion is remain hidden” (200b12). It is clear initially that the various formulations of the definition of change given in *Physics* III are meant to be very general. They are at least general enough to maintain at least nominally the interchangeable use of μεταβολή and κίνησις Aristotle has exhibited up to this point in the *Physics* and to include both terms in the formulations of the definitions. What then are we to make of the fact that in book V Aristotle restricts the scope of κίνησις by distinguishing it from the more general class of μεταβολή? Is the refinement in book V meant to be also a retroactive restriction and exclusion of substantial generation from the definitions of motion in book III? If substantial generation is excluded from the definition of motion, its status as a subject of knowledge for natural science is called into question.

Once we reach the core of the definition we will see that the concept of potentiality at work in it is also the critical concept needed at this stage of our investigation into the intelligibility substantial generation. In the following, I will discuss in detail the axioms underlying the definition of motion, the possible problem of circularity of the definition, the relation of the definition to the categories, and end with an interpretation of the definition which takes account of grammatical details that competing interpretations cannot and which sheds light on some of the difficulties posed by substantial generation. If we find that

substantial generation can be understood in terms of the definition of motion, this will in turn show how substantial generation is both intelligible and compatible with the study of nature.

4.1 Preface to the Definition

Physics III marks, as it were, a third beginning to the investigation into nature. Book one gave us the first beginning establishing the necessary principles of natural science with its point of departure in the consideration of his predecessors. Book two began afresh by explaining what is meant by the term *phusis* and to explicate the causes that are appropriate to natural science. And now in book three Aristotle turns to start again with a third set of conceptual tools providing a definition of motion that will pervade all physical inquiry.¹⁵⁸

Aristotle begins by stating why change [μεταβολή] needs clarification: “For it is necessary, being ignorant of it [change], to be ignorant also of nature” (200b13).¹⁵⁹ In the roughly seven formulations that embody Aristotle’s

¹⁵⁸ Another way of considering these differences more specifically is as follows. In *Physics* I, motion is approached from the point of view of contraries and substrate. *Physics* II considers motion in terms of nature as an inner principle and the four causes. In book three, Aristotle employs the ideas of potentiality and actuality to determine the essence of motion.

¹⁵⁹ Here and following I will translate κίνησις as motion and μεταβολή as change faithfully to eliminate any confusion in terms. Occasionally translators either transpose the translation of these two terms or translate κίνησις as change and μεταβολή as mutation or some equivalent. When referring to a commentary or translation that translates in a way different from my own, I will alter their translation to conform to my own usage for the sake of clarity.

definition, he for the most part maintains the use of κίνησις.¹⁶⁰ It is clear that at this point he is still using this term interchangeably with μεταβολή.¹⁶¹

After foreshadowing the investigations into the infinite, time, place, and void (the necessary concomitants of motion) which follow the initial discussion of motion (200b16-24, cf. III.4-8 and *Physics* IV), Aristotle lays out a series of presuppositions necessary for the definition of motion.¹⁶² First, he makes a distinction between those things which exist in complete actuality (τὸ μὲν ἐντελεχεῖα μόνον, 200b26) and those which exist both in potentiality and actuality (τὸ δὲ δυνάμει καὶ ἐντελεχεῖα, 200b26-7). The beings to which the definition will apply belong to the latter class (the former being the unchanging beings always existing in actuality including the prime mover and other “unmoved movers”).

As an addendum, Aristotle mentions the categories in order to add that motion belongs to all the ways of being. Of the things that are subject to motion they are “either being a this, being this much, being of this kind, or *similarly with the other ways of attributing being*” (220b29-30, emphasis mine). The fact that Aristotle includes all of the categories has caused confusion among commentators. Aristotle indicates that motion takes place in all of the categories

¹⁶⁰ 201a11, 201a28, 201b4, 201b33, 202a7, 202a15, and 202b27.

¹⁶¹ Cf. *Physics* 218b18: “That then, time is not motion is clear, and it makes no difference to us in the present inquiry to speak of motion or change.”

¹⁶² Cf. Simplicius (2002, 15), Philoponus (1994, 13 and 18), and Aquinas (1999, 151).

(because potentiality and actuality are present in each of the categories)¹⁶³, but even when Aristotle restricts the usage of κίνησις in Book V the only category excluded from κίνησις yet included in the class μεταβολή is substance.

Many commentators find this to be a problem given Aristotle's remarks in *Physics* V. However, an insight shared by a number of medieval Islamic philosophers may offer a viable solution. Ibn as Samh, for example, makes a distinction between 'accidental' and 'essential' motion: "Motion exists in all the categories, but it will be explained that in some categories motion exists only accidentally, not essentially – for instance, in the category of the relative" (169, 1-4; quoted from Lettinck 1994, 195). Motion proper (κίνησις) would belong to the categories of quality, quantity, and place alone and motion in these categories will be 'essential' motion. Motion will be found in the rest of the categories only 'accidentally' as concomitants of the three types of 'essential' motion. Thus motion will occur accidentally in the categories of relation (as Ibn as Samh mentions), action, passion, time (though this is redundant being posterior to motion), and also substance. The inclusion of substance in the list of accidental motion poses a special problem of its own. For although substantial generation,

¹⁶³ Aquinas (1999, 142): "[...] He sets forth three divisions. The first is that being is divided by potency and act. This division does not distinguish the genera of beings, for potency and act are found in every genus. The second division is that being is divided into the ten genera, of which one is 'a this', i.e. substance, another 'quantity', or 'quality' or one of the other predicaments. The third division pertains to the category of relation. Motion seems in some way to belong to this genus, insofar as the mover is referred to the mobile object. In order to understand this third division, it must be noted that, since relation has the weakest existence because it consists in being related to another, it is necessary, for a relation to be grounded upon some other accident. For more perfect accidents are closer to substance, and through their mediation the other accidents are in substance." For Aquinas' remarks on these presuppositions of motion see Aquinas 1999, 140-144.

according to Aristotle, always *involves* motion in one of the categories (cf. *Metaphysics* 1042b3 and my discussion of *Physics* I.7 above), this inclusion may violate the notion that substantial generation could be reduced to alteration or some other kind of motion (190b18).¹⁶⁴

The second axiom at first appears to bring motion under the category of relation:

Being in relation to something is attributed to exceeding and falling short, or to what acts and what is acted upon, or generally to what moves [something] and what is moved; for what moves is a mover of something moved, and what is moved is moved by something moving, and there is no motion apart from things. (200b30-4)

This dense sentence intimates several *aporiai* that Aristotle deals with in the course of the discussion of motion. What is the relation of the mover and moved? What is the mode of being of motion; is it something separate from the things that move and are moved? In which of the two beings in the relation of mover and moved ought we to understand the presence of motion? This statement is puzzling in that it seems to limit motion to the category of relation. In book V,

¹⁶⁴ Wolfson provides a quite ingenious reconstruction of a distinction in Aristotle between what Wolfson calls a 'sustaining subject' and a 'material subject' which relies on and follows from the distinction between essential and accidental motion. On Wolfson's reading the problem of how to divide up κίνησις and μεταβολή is easy once we make a distinction between accidental and essential motion. Unfortunately, this leaves us in the position of understanding substantial generation as accidental and hence a derivative kind of motion (cf. Wolfson 1971, 71-75 and 507 ff.). There is a related difficulty of reconciling this inclusion of motion with his usual statement of either four categories in, for example, *Categories* 14 15a ff. and *De Anima* I.3 406a. Wolfson: "It is true, Aristotle has stated that there is no *motion* in the categories of relation, action, and passion, but he did not explicitly say that there is no *change* in those categories. Furthermore, in one place at least, Aristotle has stated quite the contrary, namely, that there is motion in the categories of action and passion" (1971, 71-2). It is at this point that Wolfson makes an appeal to the distinction between sustaining and material subjects to help Aristotle: "if you consider change with reference to the sustaining subject, it may be found also in some of the other categories" (1971, 73, cf. 500 ff.). Cf. also Simplicius (2002, 19).

Aristotle claims that changes in relation are not properly motions but changes in the wider sense.¹⁶⁵ Motion seems to belong most appropriately to the category of relation as it always involves the relation of mover and moved. But relation is understood primarily in terms of quantity (exceeding and falling short, 200b31) as well as action and passion (200b32). In the discussion of the Pythagorean and Platonic understandings of motion, Aristotle will determine to which of these motion belongs (201b20 ff.). Ultimately, Aristotle relates motion not with the relation of excess and defect as Plato had but with the relation of action and passion. This foreshadows his final and richest articulation of the definition of motion which includes reference to action and passion.

Aristotle illustrates the relation of motion to the categories as a whole, whether it is a genus separate from the others, whether it is applicable to all and further whether it is thus predicated univocally or equivocally with regard to each of the categories. Or to put it in Platonic terms, whether there is a Form of Motion itself by itself.¹⁶⁶ Because things change either

in being [οὐσίαν], or in quantity, or in quality, or in place, and there is *nothing to take hold of which is common to these*, and is neither, in our manner of speaking, a this much, nor an of-this-kind, nor any of the kinds of being: so that neither motion nor change will be anything apart from the things named, since there is, in fact, nothing other than the things named. (200b34)

¹⁶⁵ Aquinas takes it that “motion seems in some way to belong to this genus [relation], insofar as the mover is referred to the mobile object” (Aquinas 1999, 142). Aquinas softens the difficulty remarking that “relation has the weakest existence” because a relation is always dependent on two subjects residing in another category. Simplicius raises the question relevant here, “But if all change is viewed in the category of relation as consisting in changer and changed, how can changes, being in one genus, not be univocally named but be equivocally named?” (Simplicius 2002, 20).

¹⁶⁶ Cf. Simplicius (2002, 19).

Since the categories are exhaustive, and potentiality and actuality are present in them all, motion too will belong to each of the categories since it is not a separate genus of its own.

There is a difficulty here concerning whether motion applies to all of the categories in the same way. If motion is predicated equivocally in each of the categories, is there a category to which the term motion applies more than others? Is it the same with motion as health is in a doctor, in medicine, in urine, and in the body, as all of these are healthy in reference to the health of the body as cause, instrument, indication, and subject of health (to paraphrase Aristotle and Aquinas)? Further, if motion is predicated equivocally among the categories, its definition must also likewise be equivocal in the suitable way. As Simplicius remarks, “It has already been said that change is not predicated of the many kinds of change univocally but is among the terms with many senses. Since it is such, its definition must also be taken equivocally” (2002, 32).¹⁶⁷ Philoponus has another way of putting what I take to be the same point: “His intent, then, is not strictly to give a definition of change, but to sketch an account which will square with every change by analog, just as he has done in the case of soul” (1994, 15).¹⁶⁸

¹⁶⁷ Simplicius at length: “But if change is equivocally named, how does he define it? For there are no definitions of the equivocally named, or else the definition of the equivocally named is also equivocal. For since the primary (*arche*) is equivocally named the definition that says that the primary is the first in each thing is also equivocal. Moreover, the actuality of the changed *qua* changed will be equivocal. For the product of the equivocals is equivocal” (2002, 21).

¹⁶⁸ Aquinas shares a similar view: “In these genera there is no common univocal thing which would be their genus and which would not be contained under some predicament. Rather being is common to them by analogy, as is demonstrated in *Metaphysics* IV. Hence it is clear that there is no motion or mutation outside the above mentioned genera. For there is nothing beyond these genera, since they divide being sufficiently

To summarize, the axioms Aristotle has presented in preparation for his definition of motion are: a) there are some beings which are only actual and some that are both potential and actual; b) all of the beings that are both potential and actual are contained by the ten categories, so that motion will be of things in any one of the categories; and c) there is no genus of motion over and above the categories, i.e. there is no Form of Motion in the Platonic sense.¹⁶⁹ These axioms serve to demarcate the domain of beings to which the definition of motion will apply (i.e. dividing off natural from divine beings), show the scope of the definition among those beings to which it applies, and ultimately prepare us for the right sort of definition (an equivocal definition for an equivocal term).

4.2 Analysis of the Definition

Physics III.1-3 supply a progressive, dialectical definition of motion. They constitute a single definition of motion, though some formulations are more important than others and some are merely reiterations of a more primary formulation. There are nonetheless three identifiable and distinct versions of the definition. Here are the formulations in the order they appear in the text:

well. He will show below how motion is related to the predicament of action or passion [cf. *Physics* III.3]” (Aquinas 1999, 143).

¹⁶⁹ Cf. 200b32 ff. Heidegger puts this well: “Κίνησις is not *παρὰ τὰ πράγματα* [“beside the things”] (200b32f.), is not a *γένος*; on the contrary, in each case only as a *determination of Being*, characteristic of a being which is such and such, and indeed it applies to οὐσία, κατὰ ποσόν, ποιόν, τόπον [“with respect to quantity, quality, place”] (cf. 200b34). Κοινὸν { ... } οὐδὲν { ... } λαβεῖν [“something common to them cannot be found”] (200b34f.)” (Heidegger 2008, 143).

- 1) “A distinction having been made in each kind of being between the fully active and what is only potentially, the *entelecheia*¹⁷⁰ of whatever is potentially [δυνάμει], *just as such* [ἢ τοιοῦτον], is motion” (201a9).
- 2) “The *entelecheia* of what is potentially [δυνάμει], whenever, being fully at work, it is at work *not as itself* but just as movable¹⁷¹ is motion” (201a27).
- 3) “The *entelecheia* of a potentiality [δυνατοῦ], as a potentiality [ἢ δυνατόν], is motion” (201b4).
- 4) “Motion seems to be a certain *energeia*, but incomplete” (201b31).¹⁷²
- 5) “Motion is the *entelecheia* of the movable, as movable” (202a7).¹⁷³
- 6) “The *entelecheia* of the thing causing motion is nothing other than this, for it [motion] must be the *entelecheia* of both” (202a15).

¹⁷⁰ The terms ἐνέργεια and ἐντέλεχεια remain untranslated at the moment for the sake clarity though for there seems to be no discernable difference between the two in this context.

¹⁷¹ An alternate reading from version I (I = Vat. 241, saec. Xiii) of the text in the OCT reads “not as itself but as another” (ὅυχ ἢ αὐτὸ ἀλλ’ ἢ ἄλλο) in place of “not as itself but as movable” (ὅυχ ἢ αὐτὸ ἀλλ’ ἢ κινητόν) in Ross’ text. The text of version I echoes the discussion of potentiality in *Metaphysics* IX.1 (e.g. 1045b11) and if correct would help remove the problem of circularity from this formulation.

¹⁷² Cf. *De Anima* III.7 431a6-7: “motion is actuality of the incomplete, but the actuality simply is other, it is the actuality of that which has been completed” (translation from Polansky 2007, 482). Compare also *De Anima* 416a16-17, *Metaphysics* 1048b29-36, and *Physics* 257b6-9 (the only place where Aristotle pairs *entelecheia* rather than *energeia* with *ateles*).

¹⁷³ Cf. *Physics* 251a10 repeats this formulation in book eight. This formulation and the surrounding passages also occur in *Metaphysics* XI.9 (cf. 1065b16 for the formulation of the definition).

- 7) “Motion is the *entelecheia* of the potentially-active-or-acted-upon [ἡ τοῦ δυνάμει ποιητικοῦ καὶ παθετικοῦ] *as such*, both simply and in each case” (202b26).

Formulations (1) & (3) constitute the primary formulation of the definition which we will identify as type one formulations.¹⁷⁴ Formulations (2) & (5) have been the source of the majority of confusion about Aristotle’s definition. When we refer to type two formulations, these are being referred to. Formulations (6) and (7) are closely related and represent the fullest articulation of the Aristotle’s definition. These, which we could call type three though we do not discuss them further, are only different from type one formulations by the addition of predicates action and passion into the definition.¹⁷⁵ The significance of this addition, while important for a full understanding of Aristotle’s definition of motion, is beyond the scope of the current essay.¹⁷⁶

The first thing to note is an important semantic peculiarity of the definition. In this definition we have a paradoxical mixture of two of Aristotle’s principle terms which is easily lost in English translation: Motion is the actuality of a potentiality insofar as it is a potentiality. One of Aristotle’s formulations of this brings out the paradox well: “So motion seems to be a certain *energia*, but

¹⁷⁴ Formulation (4) does not really deserve a type designation of its own but can be viewed as a lemma to the type 1 formulations.

¹⁷⁵ Simplicius, for example, identifies three distinct definitions: (3), (4), and (7) each being distinct and increasing the adequacy and exactness of the previous (Simplicius 2002, 155n174), (3) is most general and defines in terms more primary than motion (potency and act), (4) restricts the scope of the definition to four of the ten categories, (7) includes a reference to the changer and the changed which yields a complete definition.

¹⁷⁶ For a detailed treatment I refer the reader to Gill’s seminal essay on *Physics* III.3 (Gill 1980).

incomplete (ἀτελής)” (201b31). *Energeia*, along with its fraternal twin *entelecheia*, signifies the complete being of something, something which is not lacking anything that is proper to its being. To say that an *energeia* or *entelecheia* is incomplete is *prima facie* oxymoronic: an *entelecheia* is *ateles*. When potentiality (δύναμις), which is by nature incomplete, is somehow understood as in full or *complete* activity, Aristotle tells us, this is motion. The full actuality of what is by nature incomplete is motion. The incomplete nature of potentiality only manifests itself in motion which is the only phenomenon in which we can observe the incomplete, and therefore also potentiality, as such.¹⁷⁷ We will see further on that the dependent clauses, ἢ τοιοῦτον and ἢ δυνατόν, in the full formulations of the definition strengthen the oxymoronic quality.

i The Charge of Circularity

Aristotle has often been accused of proposing a definition of motion which is patently circular and for this reason not a legitimate definition. Commentators who charge Aristotle with such an amateur blunder focus on type two formulations of the definition and read the others through it.¹⁷⁸ Formulations (2) and (5), while of course not incorrect, add little substance to the definition.

¹⁷⁷ “If the only way in which potentiality can exist unfulfilled is in the form of a change towards its fulfillment, such a change or κίνησις is the only form of actual existence which a potentiality can enjoy insofar as it is only a potentiality (i.e. insofar as it is unfulfilled). But to say this is to assent *verbatim* to Aristotle’s famous definition of κίνησις” (Hintikka 1977, 60).

¹⁷⁸ Formulation (2) “The *entelecheia* of what is potentially, whenever, being fully at work [ἐντελεχείᾳ], it is at work not as itself but just as movable [ἢ κινητόν] is motion” (201a28), and (5) “Motion is the *entelecheia* of the movable, as movable” (202a7).

However, this is only a problem if we try to understand these formulations before the others. If we overlook the priority of the definitions (even if only the order of their exposition) we risk accusing Aristotle of what would really be an amateur blunder. It is therefore important to read the second definition not as a simple repetition of the first but as offering some refinement or modification or description.

Even attempts by sympathetic readers of Aristotle have found it difficult to navigate their way out of the apparent circularity of the definition. The most notable example is Ross who understands by the phrase “*entelecheia* of a potentiality” the “actualization of a potentiality” using a synonym for motion in the very definition of motion.¹⁷⁹ Ross has been rightly criticized and corrected by Kosman¹⁸⁰ (whose view has received almost unanimous consent in current scholarship) and Joe Sachs.¹⁸¹ Recently some dissent has generated in opposition to Kosman’s interpretation which,¹⁸² while not wholly adopting Ross’ interpretation, tries to revive the idea that *entelecheia* should be understood as

¹⁷⁹ Cf. Ross 1966, 81-82. Many distinguished commentators and philosophers have fallen prey to this misunderstanding of Aristotle’s definition. Maimonides interprets it such a way that renders it a circular as well: “Every motion is the change and transition from potentiality to actuality” *Guide of the Perplexed* Part II, Axiom 5 (Maimonides 1963, 236). Also, Shem-tob Falaquera: “a certain learned man said: ‘motion is a first entelechy [of that which is] in potentiality insofar as it is in potentiality, and if you prefer you may say that it is a transition from potentiality to actuality’” (Wolfson 1971, 525; also cited by Sachs 1976, 12). Descartes’ own definition suffers also from a similar and perhaps worse circularity of definition: “motion... is nothing more than the action by which any body passes from one place to another” (*Principles* II. 24).

¹⁸⁰ Cf. Kosman 1969.

¹⁸¹ Cf. Sachs 1976. Sachs for the most part is in agreement with Kosman but gives a kind of genealogy of the modern misinterpretations in a way that renders his account clearer than Kosman’s.

¹⁸² The primary examples are Kostman (1987) and Heinaman (1994).

“actualization” in the formulation of motion as the “*entelecheia* of a potentiality, qua potentiality” despite the fact of its blatant circularity.¹⁸³

ii The Relations Between the Formulations

In order to address the problem of circularity one need only recognize that there is an important priority among the several formulations of the definition of motion. To avoid circularity, the formulations should be prioritized and characterized as follows: (1), (3), and (7) are the most substantial formulations being free from the problem of the circularity. (4) and (6) are helpful clarifications and developments of what is implicit in (1), (3), and (7). According to several Islamic commentators, (2) and (5) constitute a refinement to the formulations (1) and (3) by restricting the definition of motion to apply only to those categories to which it properly applies, i.e. substantial generation, alteration, change in quality, and change in quantity.

Each of these formulations is meant to address a specific *aporia* which Aristotle develops in the course of *Physics* III.1-3. For example, having made the distinction between *dunamis* and *energeia*, the question arises as to which of

¹⁸³ Generally there are two camps into which the commentators on Aristotle’s definition of motion fall. One camp, the most prevalent at the moment, understands *entelecheia* in the definition to refer to the ‘product’ or complete actuality; the other takes *entelecheia* to mean actualization or process. The former we can label the ‘actuality-view’ and the latter the ‘process-view’ following James Kostman. The process-view which derives from Ross’ interpretation has fallen somewhat into ill repute in recent scholarship though Ross has found support from Penner (1970, 393-360, and especially 427-433), Kostman (1987), and Heinaman (1994). Sachs points out that Ross’ interpretation has its origins in Maimonides and Averroes (Sachs 1976, 14). The advocates of the actuality-view include Kosman (1969), Hintikka (1977, 59-77), Hussey (1983, 55-65), Gill (1980, 129-147, especially 130-133), Owens (1978, 120-132), and Broadie (1982, chapter 3).

these motion belongs. Also from the discussion of axioms, there is still a question as to which of the categories motion belongs. These could be thought of as distinctions of what motion ‘is’ and what motion is ‘of’. Is motion a *dunamis* or an *energeia*? And to which of the categories does the concept of motion apply? The first formulation of the definition is designed to address the first question. The second formulation narrows the scope of the definition to the categories proper to change. Before the definition Aristotle argued that change can be found in all of the categories of being (201a9). In the second formulation he begins to solve the *aporia* of which of these it belongs to most by making an appeal to the things in motion or which are movable.¹⁸⁴

Formulation four arises out of a peculiarity about motion which concerned Plato and the Pythagoreans, namely that “motion seems to be something indefinite [ἀόριστον], while a whole array of negative principles seems also to be indefinite, since none of them is a this nor an of-this-kind nor belongs to any of the other ways of attributing being” (201b25) on account of which they were apt to place motion in the genre of “otherness or inequality or non-being” (201b21).

¹⁸⁴ Several Arab commentators defend formulations (2) and (5) from the circularity charge on the grounds that the “movable” is better known than “motion” itself (Averroes [Ibn Rusd], Ibn Bajja, etc.; for these and more see Lettinck 1994). This does not however completely resolve the objection of Aristotle’s critics. What would need to be shown is how formulations (2) & (5) *contribute and elucidate* the first formulation in the progression of the arguments in III.1-3. They claim that the first definition (“the *entelecheia* of whatever is potentially, *just as such*, is motion” (201a11)) holds for all of the categories of being while the formulations in (2) and (5) restrict the broader formulation to the categories to which motion properly applies. At this point prior to *Physics* V this includes all four kinds of motion: alteration, growth, locomotion, and generation. This appeal to the greater familiarity of the moved and things in motion over motion as such allows Aristotle to say by the end of chapter one that the “definition has been well stated” and proceed to a defense of further objections arising from predecessors views about the character of motion in chapter two.

Motion seems to involve, or even more strongly, even simply *be*, some sort of lack or negation. The proximity of the Eleatic paradoxes of motion and the ban on the study of nature should be felt strongly here. It is precisely this aspect of the phenomenon of motion that led many of Aristotle's predecessors to believe that strict knowledge of movable beings, nature, and even the idea of motion itself was not possible. The formulations that qualify motion and change as some sort of incomplete *energeia* contribute very little to the definition, but we can understand their role as a response and partial capitulation to Plato and the Pythagoreans. These are presented primarily to address the concern of Aristotle's predecessors that motion partakes in the indefinite.¹⁸⁵

Formulation six contains another principle which addresses a specific *aporia*: "And the riddle [ἀπορούμενον] is now solved, since motion is in the thing moved" (202a13).¹⁸⁶ The *aporia* concerning 'where' motion might be if it is

¹⁸⁵ This distinction of "being incomplete" is more helpful and perhaps necessary for distinguishing motion from *energeia* in the strictest sense. We find such an analysis in these terms in a controversial passage in *Metaphysics* IX.6 (especially 1048b19-1049a1). This passage has been a major preoccupation for analytic philosophers who are primarily concerned with language and who think that Aristotle must have been too. There is a very large literature on this subject which has its roots in an essay in Ryle's *Dilemmas* (1954) and Ackrill's response to it (1965). Ackrill's essay is responded to in turn by Terry Penner (1970). The debate stems from the interpretation of the so-called "tense test" by which Aristotle is thought ground the distinction between *kineseis* and *energeai* by means of the linguistic difference between activities which can be expressed in the present and the perfect tenses concurrently (e.g. seeing and having seen; living and having lived) and those for which the two tenses do not coincide (e.g. building and was built, in which case the state of having been built only occurs once building is no longer going on). Polansky (1983) correctly reorients the discussion of the difference between *kineseis* and *energeai* by arguing that the distinction is not primarily linguistic but based on the peculiar features that many psychical activities have that most physical motions do not. That is, being complete at every moment, "the end is in the activity itself" (Polansky 1983, 165; cf. 160-1).

¹⁸⁶ Sachs (1991, 43) thinks the reference is to Zeno fragment 4 in Diels: "The moving thing is in motion neither where it is nor where it is not."

not a separate entity in its own right has been present all along but only now is Aristotle in a position to solve it with the argument that “motion is in the thing moved.” Given motion entails the *interaction* of two subjects (the mover and the moved), the activity (ἐνεργεία) of the mover is the being-moved of the moved and that motion is the *entelecheia* of *both the mover and the moved*. This must not be misunderstood as saying that motion is somehow also in the mover for he says in the immediate prequel that motion is *in* or *of* the thing moved but also *from* the mover (202a13). Formulation seven will incorporate the solution to this *aporia* in the final and most comprehensive formulation of the definition.

(It was not uncommon for medieval commentators to reduce the several formulations to two distinct definitions of motion. The first is exemplified by formulation (1) and the second by formulation (5) (cf. Wolfson 1971, 523). Generally they determine the priority through a consideration of which the categories the term motion applies to most. It is important to understand the priority of the formulations in order that we keep ourselves from reading a posterior formulation backwards into one prior and to avoid the problem of circularity. Many ancient commentators agreed that there is in actually more than one version of the definition or at least that the initial definition evolves over the course of book III. On the importance of a particular formulation over another and their meaning, there is wide disagreement and was a subject of a lively debate among Neoplatonic and Medieval commentators. (See endnote for a selection of passages relevant to this debate.)¹⁸⁷

¹⁸⁷ According to Simplicius, Aristotle modifies the first formulation of the definition lest the reader think that change is something merely potential. He therefore reads the

second formulation as anticipating the discussion of the difference between motion of bronze becoming a statue from the bronze itself which immediately follows:

He now gives a *more complete* definition by adding that the potential object whose actualization is change is not only potential, but it is completely something also in actuality, since it is a determinate nature among the existents. (Simplicius 2002, 39, emphasis mine)

Philoponus understands the second formulation to be a restriction of the first definition to the categories to which it properly applies and hence as a modification:

Aristotle, in view of the fact that potential being belongs to every category but change does not belong to all, reasonably amends his definition. (Philoponus 1994, 39)

Aquinas provides an illustration of how to understand the relation of the two definitions and which prioritizes the first definition over the second:

It can be said that he sets forth *another definition of motion* which is [subordinately] related to the definition already given as the material is related to the formal and as a conclusion is related to a premise. The definition is as follows: motion is the act of the mobile object insofar as it is mobile. (Aquinas 1999, 152, emphasis mine)

Shem-tob Falaquera also finds the first formulation more helpful in that it gets at the “nature” of motion whereas the second definition acts as an articulation of a sort of essential accident of motion:

A certain learned man said: ‘motion is a first entelechy [of that which is] in potentiality in so far as it is in potentiality, and if you prefer you may say that it is a *transition from potentiality to actuality*.’ The first definition explains more accurately the *nature* of motion than the second, for motion must exist potentially, being something intermediate between potentiality and actuality [...]. It must combine both potentiality and actuality. (quoted from Wolfson 1971, 525, emphasis; also cited by Sachs 1976)

Averroes finds formulation 5) (the second definition) more helpful:

The first definition [formulations 1) & 3)] is, according to him [Aristotle], equivocal and not especially appropriate and applicable to motion in the strict sense of the term [i.e. the sense which is restricted to the four primary kinds of motion]. In the second definition he finds that the differentia is derived from the term which forms the subject of the definition, [hence the charge of circularity]. [...] This differentia, used in the present [the second] definition, though not the same as the differentia used in the first definition, being a differentia derived from the subject of motion, is still *superior to the differentia used in the first definition, for it does not contain that equivocation which is contained in the term potentiality*. (Wolfson 1971, 523-4, emphasis mine)

The key to avoiding circularity in definition is recognizing the priority of the definitions. It is the mis-prioritization of the formulations that is responsible for most of the modern misunderstandings of the definition including the charge of circularity. Let us then look at the most important formulations in more detail to get a view to the difficulties they have engendered and how these might be resolved. We will then see how the second definition follows from the first and how the other formulations are lemmas to these.

4.3 Interpreting the Definition

Now that we have some sense of the importance of the priority of the formulations, we can get a deeper grasp of the definition itself by looking at its primary articulation, namely those of type one. There are typically two approaches taken by commentators interpreting Aristotle's definition of motion. The first is the actuality-view which understands *entelecheia* and *energeia* always to signify a state of being rather than a process. The process-view on the other hand interprets *energeia* as "process-product" ambiguous in order to account for the idea that motion is a type of *energeia*. We will find that the

An anonymous supercommentary on Averroes clarifies:

This differentia, even though not as good as that used in the first definition, being a differentia derived from the subject of motion, whereas that of the first definition is derived from the things which are only appropriate and applicable to motion, is still superior to the differentia used in the first definition [...] because it cannot be applied to any other category outside the four genera of motion, namely substance, quantity, quality, and place, whereas the first definition may be applied to all the ten categories, for in all the ten categories there are a potential and an actual. (Wolfson 1971, 524-5)

actuality-view is not only truer to Aristotle's text, but is of significant assistance with our original problem of reconciling the definition of motion with the difficulties presented by substantial generation.

Again, the primary type one formulations of the definition of motion which we are interested in are:

- 1) "the *entelecheia*¹⁸⁸ of whatever is potentially [δυνάμει], *just as such* [ἢ τοιοῦτον], is motion" (201a9).
- 3) "The *entelecheia* of a potentiality [δυνατοῦ], *as a potentiality* [δυνατόν], is motion" (201b4).
- 7) "Motion is the *entelecheia* of the potentially-active-or-acted-upon [ἢ τοῦ δυνάμει ποιητικοῦ καὶ παθετικοῦ] *as such*, both simply and in each case" (202b26).

A paraphrase condensing all three of these would be something like: "Motion is the actuality of a potentiality (to act upon or be acted upon), as such, i.e. as a potentiality." There are two ways to construe *entelecheia* and *energeia* here. They can either mean actuality in the sense of an end-state (e.g. the completed house in Aristotle's example) or *actualization*. Ross opts for the latter with a number of important consequences.¹⁸⁹ First, he prematurely falls into the problem of definitional circularity. Ross makes the problem of circularity common to all of the formulations whereas it should really only be a problem for

¹⁸⁸ The terms ἐνέργεια and ἐντέλεχεια remain untranslated at the moment for the sake clarity though for there seems to be no discernable difference between the two in this context.

¹⁸⁹ Indeed, as Ross admits, this would be the only such usage in the Aristotelian corpus (Ross 1936, 536 ff.). All other uses of ἐντέλεχεια mean the actuality of the end state of a process or the persistence in being of a being.

formulations (2) and (5). Second, Ross' translation renders the dependent clause “ἢ τοιοῦτον” superfluous.¹⁹⁰ Penner (1970) argues that *energeia* is process-product ambiguous and for this reason requires a translation into an English word that is equally process-product ambiguous.¹⁹¹ Conveniently, he believes, “actualization” is such a word and is hence the best candidate to translate *energeia*.

Kosman (1969) and Sachs (1975) both have argued convincingly that ἐντελέχεια and *energeia* must be understood as the state of completion in order for the definition to avoid circularity and account for the peculiar syntax surrounding the “as such” phrase in the definition. Ross' reading ultimately interprets the definition as saying ‘motion is the actualization of a potentiality’ which eclipses several important aspects of Aristotle's definition. Ross supposes there are two ways to construe the definition depending on how we understand the meaning of potentiality. Ross' note to 201a9-b15:

An aggregate of bricks, stones, etc., may be regarded (1) as so many bricks, stones, etc. [i.e. as actualities in their own right, cf. 201a30 ff.], (2) as potentially a house, (3) as potentially in the course of being fashioned into a house. [That the potentiality involved in motion is not (1), is obvious], nor (2) of their potentiality of being a house (the *house* is the actualization of this), but (3) of their potentiality of being fashioned into a house. (Ross 1936, 536)

¹⁹⁰ Kosman (1969, 42).

¹⁹¹ Penner does not explicitly address Aristotle's consistent use of ἐντελέχεια which is not unexpected given that his case would be much more difficult to make regarding that term. As Kosman puts it, “the term ἐντελέχεια [would have to] signify a process and not a state or condition which might result from a process. There is a sense in which it would be correct, though dangerous, to say this of ἐνέργεια’. But although Aristotle elsewhere speaks of motion as a kind of ἐνέργεια, he consistently employs the term ἐντελέχεια in the version of the definition of motion which we are considering [i.e. those found in *Physics* III]” (Kosman 1969, 42).

Ross thus lays out the alternatives for both the actuality-view and the process-view of the definition of motion. The former on Ross' reading understands motion to be the actualization of the potentiality to be a house in Ross' (2), the latter that motion is the actualization of the potentiality to be fashioned into a house in Ross' (3).

But is not the *actualization* of the potentiality to be a house that is motion, but rather it is the *actuality* of the potentiality to be a house. This difference is important in that it relieves the actuality-view of Ross' misgiving that it would indicate not the process of becoming a house but the being of the completed house itself. Those who endorse the process-view generally maintain this misconstrual of the actuality-view and argue a) that actualization is an accurate rendering of both ἐνεργεία and ἐντελέχεια (of which the latter is particularly problematic), b) that reference to the end-state is inappropriate in the definition of motion but nonetheless the definition is not circular, and c) the phrase “qua potentiality” is essential only in the interpretation of process-view. Kostman supports the process-view against the charge¹⁹² of rendering the phrase “as a potentiality” superfluous:

For the actuality-view, the problem is simple: “*qua* potential” serves to distinguish the actuality *resulting from* the change (being actually *F*) from the change itself (being actually potentially *F*) – the latter being a state the changing object is in just when it is changing. But is there any evidence in *Phys.* III.1-2 for this interpretation? (Kostman 1987, 5-6)

¹⁹² Namely the charge made by Kosman against the process view (Kosman 1969, 42).

Kostman's account demands that we understand the "as such" as making a temporal qualification. His understanding of the "as such" clause is that it is meant to emphasize,

[T]he thrice-repeated point that change exists just *when* the object is changing. In some fashion, "*qua* potential" qualifies the ontological status of *entelecheia* or *energeia* without directly fixing the sense of the terms that apply to such entities. But, at first glance, the point that *entelecheia* or *energeia* of the sort in question is an entity whose existence has *temporal limits* seems unhelpful; and the point that these limits coincide with the times that the object begins and ceases changing seems entirely neutral between the process-view and the actuality-view. (Kostman 1987, 7)

His claim is that even though the "as such" clause does in fact play the role of marking a temporal determination in the definition, he finds that it constitutes a fruitless addition to the definition. Kostman supposes that Aristotle is fumbling to make a distinction, familiar to modern analytic philosophy, between events and states.¹⁹³ This statement reveals tendency in modern commentary to understand Aristotle in terms of often anachronistic concepts like events, processes, states, etc. As we can see in Kostman's interpretation of Aristotle, even reverses Aristotle's claim of the primacy of motion to time since time is a measure of motion (cf. *Physics* IV.10-14, cf. especially 219a1, but contrast 220b17).

The strongest evidence in favor of the process-view can be gleaned from Aristotle's examples of building house and sculpting statues which he uses to clarify what he means by the phrase "as such":

¹⁹³ Cf. Kostman (1987, 7): "The concept Aristotle is analyzing is that of an event, and the remainder of his analysis is the claim that an event must be understood as the actualizing of a potentiality." One should suspicious anytime someone accuses Aristotle of a serious gaffe especially if he is thought to be struggling with an anachronistic concept. It is likely that Aristotle deserves the benefit of the doubt more than do most commentators.

By the “just as” I mean this. Bronze is potentially a statue, but it is not the *entelecheia* of bronze as bronze that is motion; for the being-bronze itself is not the being-potentially-something [in motion]¹⁹⁴, since, if they were simply the same and *meant* the same thing, the *entelecheia* of the bronze as bronze would be motion. But they are not the same, as was said. [...] Since they are not the same, just as neither are a color and capable of being seen the same, it is clear that the *entelecheia* of a potentiality, as a potentiality, is motion. (201a29)

The *entelecheia* of the buildable, just as buildable, is building. (For the *entelecheia* must be either the building or the house. But whenever the house is, the buildable is no longer. But it is the buildable that is being built. Necessarily then, building is the *energeia*.) But building is a certain motion. (201a30)

Proponents of the process-view take the distinction between ‘bronze as bronze’ and ‘being-potentially-something [in motion]’ to elucidate the phrase at 201a16-18: “*when* that which is buildable into a house, *qua* such as we speak of it, is at-work [*energeia*], it is being built, and this is the activity of building.” This formulation is generalized at 201a27-29 as “[But] the *entelecheia* of what is potentially, whenever, being fully at work, it is at work not as itself but as movable, is motion.” Ross’ gloss on this runs:

Change is not the actualization of anything in respect of its own specific character – e.g. of bronze as bronze – but of things *qua* changeable. It is the actualization, not of the capacity of being a statue, but of the capacity of being made into a statue. (Ross 1936, 360)

Both Kostman and Ross take these phrases to “explain the force of ‘*qua* potential’ by expanding it, within the definition, into a longer expression” (Kostman 1987, 6).¹⁹⁵ This interpretation, however, reads the text backwards. It is only *after* the

¹⁹⁴ Κινητῶ, bracketed by Ross.

¹⁹⁵ Kostman continues: “... but the expression is obscure especially since the expansion is in the form of a “when” –clause. It is almost as if “*qua* potential” is to be rendered as

occurrence of the house and the statue examples that Aristotle says he is explaining what he means by ‘as such’. These two examples play a completely different role in the argument which is marked by the phrase which introduces them: “That this [the first definition] is motion is clear from this: when that which is buildable [etc.]” (201a27). The argument lying between the two phrases in fact has little to do with determining the sense of the ‘as such’.¹⁹⁶ Rather the formulations of the type ‘motion is the ἐντελέχεια of the movable *qua* movable’ (type two) serve as an example which follows from the definition proper but which provides no explanatory power on its own. The invocation of the type two formulation is meant merely to confirm and reinforce the validity of the type one formulations. The phrase “By the ‘as such’ I mean this” begins *another* argument at 201a30 in which the type two formulation plays no role. Only the type one formulation is explicitly invoked in the context of these examples (201b4).

Two things are shown in the arguments that explicate the ‘as such’ clause (201a30-201b15): 1) being something potential can mean either the actuality

“*while* it is still potential,” which suggests that the point may be simply that the change exists when the object is changing” (Kostman 1987, 6). The time aspect of the ὅταν is difficult to reconcile if we are to try to understand this formulation as either the definition itself or an essential part of it. But when we take it as confirmatory evidence that the definition proper is true (as several Islamic and Neoplatonic commentators did), then this problem disappears. The inclusion of a time clause is problematic (insofar as time is posterior to motion [219a1]) *only* when we take the formulation that includes the time clause as the primary formulation of the definition.

¹⁹⁶ Within the use of these exemplifying phrases, Aristotle briefly raises a potential *aporia* concerning whether or not every mover is also moved foreshadowing the problem of a Prime Mover. Interestingly, he may at this point be posing the problem between natural and other kinds of motion: “Thus what causes motion in a *natural* way is also moved, for each thing moves both the moved and itself. To some, indeed, it seems that everything that causes motion is moved, but how this truly stands will be clear from other considerations (for there is something causing motion and motionless” (201a23).

from which something else actual comes to be (e.g. bronze as bronze) or it can mean that actuality from which something comes to be not insofar as it is that actuality but insofar as it is already, at least partially, something else (e.g. bronze as not-yet-statue), and 2) the actuality of the completed thing (statue) can not be motion given that there is no potentiality left for it to be what it already is.¹⁹⁷ The force of both of these is to show that change is found at neither of the termini of the change.

Heinaman defending the process-view reads the argument differently. For him, what Aristotle distinguishes is not the bronze as bronze from motion but bronze as bronze from a potentiality *to be in motion*:

The two occurrences of ‘they are not the same’ immediately before and after the parenthetical remark make the same point, which is the same point that 201a31-2 makes: *to be bronze* and *to be potentially changing* are distinct. And as the first clause of the passage’s final sentence (b3-5) refers to the potentiality to be changing, *it must be that same potentiality which is referred to in the definition of change at the end of the sentence*. So, contrary to Kosman’s assertion, ‘the potential qua potential’ refers to the potentiality to be changing. (Heinamen 1994, 29, emphasis mine)

Heinaman’s reading at least has the virtue of accounting for Ross’ bracketed $\kappa\iota\nu\eta\tau\tilde{\omega}$ which is present in all of the reliable manuscripts.¹⁹⁸ However, the force of his argument hinges on the claim that Aristotle is using the term ‘potentiality’ univocally in this context and this is not necessarily substantiated by the

¹⁹⁷ In a certain sense the potentiality remains even in the completed actuality but in a different way than it remains or is present during motion. Bronze retains the potentiality to be in the form of a statue when it is actually in the shape of a statue but now it has that potentiality *as an actuality* rather than as a potentiality. We return to this important point further on.

¹⁹⁸ Ironically, Heinamen manages to strengthen Ross’ interpretation by reinserting $\kappa\iota\nu\eta\tau\tilde{\omega}$.

grammar of the text. Heinaman must translate “δυνάμει τινί κινητῷ” (201a32) as “something potentially in motion” (or some equivalent) for argument to hold that this is what is being distinguished from the essence of bronze (τὸ αὐτὸ τὸ χαλκῷ εἶναι, 201a31).¹⁹⁹ However, the dative need not be translated as “in motion” as Heinaman reads κινητῷ, but this is not as natural reading it as a dative of respect for example.²⁰⁰ The phrase could be rendered “some potentiality with respect to motion” or “some motive potentiality” or “something in potentiality with respect to motion.” This would distinguish the potentialities that the bronze has *as bronze* (i.e. heaviness, fluidity, etc.) and its potentialities that are specifically relevant to *being a bronze statue* (which are the potentialities that the bronze will exhibit, as potentialities, when it is in motion toward the form of the statue).

Further, the phrase ‘they are not the same’ that Heinamen refers on the one hand to the being of bronze and on the other to the being in motion of the bronze. What his reading fails to account for is how we ought to understand the puzzling illustrations Aristotle gives us to clarify what he means by distinguishing bronze from whatever bronze potentially is or is potentially doing. Aristotle says this is like what is “clearly” the case with regard to contraries:

For to be potentially healthy and to be potentially sick are different.
If they were not, to be sick and to be healthy would be the same.
But the subject underlying both the health and the sickness,

¹⁹⁹ Saying that something is “potentially in motion” could be a true and even meaningful thing to say but of course it would not help in determining a definition of motion.

²⁰⁰ One might expect a participle of some kind if Aristotle were talking about an entity potentially in motion. Aristotle often uses κινουμένον when talking about beings capable of motion.

whether blood or some other fluid, is the same and one [but different from the contraries]. (201a35)

On Heinaman's reading, the analogy would have to look like this:

'to be bronze': 'to be potentially changing' ::

'to be a substrate' : 'to be potentially sick or healthy' ::

'color' : 'visible' [as potentially seen]

This would require that 'potentially changing' must be taken as analogous to 'potentially sick' and 'visible'. The incongruence of the terms is obvious; sickness and visibility are states while change indicates process. If Aristotle means what Heinaman thinks he would have said 'potentially *becoming* sick' and '*becoming* visible'. It is much more natural to read these terms of the analogy as 'potentially sick' and 'visible'.

i The Actuality View

To clear up the problems of Ross' view and the process-view, we need to look more closely at the key terms involved in the definition: actuality, potentiality, and 'as such.' Again, Ross takes *entelecheia* to mean 'actualization' which is arguably the only such usage of the term in the Aristotelian corpus. More likely, *entelecheia* means actuality in the sense of what exists fully. It is quite probable that this is a neologism invented by Aristotle out of the three words ἐν = in, τέλος = end, ἔχειν = having (which would literally yield ἐντελέχεια = in-end-havingness²⁰¹ or having-present-in-it-the-end) and perhaps a pun on

²⁰¹ See Hintikka (1977); Philoponus (1994, 14 ff.), Sachs (1995), Blair (1992), Gill (1980, 130-3).

the established Greek word ἐνδελέχεια meaning what persists or endures lends credence to this meaning in addition to the countless usages in this respect throughout the corpus (Lidell and Scott 1996, 558).²⁰²

The actuality-view operates under the idea that the actuality referred to is the actuality of the potentiality *to be* what the object is in motion toward, i.e. the finished product. The potentiality must then be understood either as what is *potentially* a potentiality or what is *actually* that potentiality.²⁰³ Motion is then the actuality of that second modality of potentiality. This assumes that there is a difference between a chunk of bronze which *might be sculpted* (i.e. moved) into a statue and the chunk of bronze actually being worked on by the artist. In the latter case the potentiality of the chunk of bronze *to be* a statue is *actual* insofar as it is fully realizing its potential to be a statue. In the absence of a working artist, the bronze is in actuality but just *as this chunk of bronze* with a particular shape, heaviness, volume, etc. which as such is not a potentiality to be a statue except in a derivative sense (i.e. as a potentiality to be *potentially* a statue).

²⁰² Philoponus: “The word ‘*entelchy*’ in Aristotle signifies actuality and completion, for it is the compound of the words *hen* (‘one’), *teleion* (‘complete’) and *ekhein* (‘have a certain state’)” (1994, 14); and cf. Sachs 1995, Introduction. It is unclear why Philoponus interpolates a rough breathing here to render what I have taken as “in” to be “one”. The difference does not change the essential similarity of his understanding of *entelecheia*.

²⁰³ A well known discussion in the *De Anima* where Aristotle makes a distinction between first and second actualities and potentialities may help in understanding the different senses of potentiality at work here in the definition of motion. Kosman’s interpretation of the definition relies heavily on the distinction in the *De Anima*. Polansky has pointed that Kosman may be taking this analogy too far. He argues that the distinction between first and second potentiality and actualities are pertinent *only* to living beings except perhaps analogously. Because there is motion among natural beings that are not alive, Polansky claims that the distinction cannot properly be operable in the definition of motion as presented in the *Physics* (Polansky 2007, 149, and 158; cf. also Polansky 1983, 169-70n12).

Aquinas offers an appealing alternative to the process-view following similar lines. While not completely compatible with Kosman and Sachs, it offers an interpretation of Aristotle's definition which both relieves the circularity from the definition and begins to understand the paradoxical nature of the definition of motion as an 'actual potential'. Aquinas' account of the definition finds a way out of the circularity difficulty by proposing that motion is a sort of mixture of or "mean" between potentiality and actuality. Between pure potentiality (bricks laying around being bricks) and pure actuality (a completed house), there is a motion in which the bricks retain some of their potentiality of just being bricks while at the same time already attaining to being a completed house:

Indeed it is true that motion is in act, but it is an imperfect act, *a mean between potency and act*. And it is clear that it is an imperfect act because that whose act it is is being in potency, as was said above. Hence it is difficult to grasp what motion is. (Aquinas 1999, 151 emphasis mine)²⁰⁴

Motion is then, contrary to the process-view, not the actuality of the potentiality to be moved, but the mixture of potentiality and actuality that takes place between the termini of the wholly potential (the potentially potential) and the fully completed actuality. It is the actuality (not the actualization) of a potentiality *to be* at the end-state. This 'mean' or mixture is itself a state of actuality. Everywhere we find a state of affairs in which a being is not yet fully what it is going to be, but on the way there *retaining* at least some of its

²⁰⁴ A longer version in Aquinas with the same import: "It must be noted, therefore, that to be only in act is one thing, to be only in potency is another thing, and to be a *mean between potency and act* is a third thing. That, then, which is potency only is not yet moved. That which is in perfect act is not moved, but has already been moved. That, therefore, is moved which is a mean between pure potency and act, which is, indeed *partly in potency and partly in act*, as is clear in alteration" (Aquinas 1999, 146 emphasis mine).

potentiality *to be* at that end-state. Aquinas identifies this mixture of potentiality and actuality with motion. Motion then is an actuality of a sort, but an incomplete one insofar as it retains some of its potentiality to be that same actuality.

While Aquinas' understanding of motion is certainly more appealing than the process-view alternative, there is at least one fundamental difficulty. For on Aquinas' understanding of the definition we have no way to distinguish between a motion between termini and a *static state* between these same termini. For example, if motion to the state of being heated is the mean between the actuality of being hot and the respective potentiality of being cold, the mixture of these applies equally well to the transition from zero degrees (being cold) to one-hundred degrees (being hot) as it does to the state of being *at* fifty degrees. There must be a way to understand the definition in some way such that motion is a mixture of potentiality and actuality but which further specifies a directionality and not merely an intermediate state. To do this we will need to look again at what role the phrase "as such a sort" or "as a potentiality" plays in the definition.

ii Potentiality As Such

Aristotle adds the phrase "as such" (ὡς τοιοῦτον, 201a11) to dispel the ambiguities which we have seen that the definition of motion and in particular the meaning of potentiality are subject. As we have seen, on Ross' interpretation the phrase becomes superfluous. Aquinas' interpretation of motion though closer to the sense of Aristotle's meaning, suffers from the defect that it cannot

incorporate the “as such” phrase within the limits of what Aristotle’s grammar will allow.²⁰⁵ Sachs illustrates this quite well so I will quote him at length rather than speak on his behalf:

Thomas’ account of the meaning of Aristotle’s definition forces him to construe the grammar of the definition in such a way that the clause introduced by the dative singular feminine relative pronoun *he* [sic. ἥ] has as its antecedent, in two cases, the neuter participle *tou ontos*, and in the third, the substantive adjective *tou dunatou*. It is true that this particular feminine pronoun often had an adverbial sense to which its gender was irrelevant, but in the three statements of the definition of motion there is no verb but *estin*. If the clause is understood adverbially, then, the sentence must mean something like: if motion is a potentiality, it is the actuality of a potentiality. Whatever that might mean, it could not at any rate be a definition of motion. *Thus the clause must be understood adjectivally, and Thomas must make the relative pronoun dependent upon a word with which it does not agree in gender.* He makes the sentence say that motion is the actuality of the potentiality in which there is yet potentiality. Reading the pronoun as dependent upon the feminine noun *entelecheia* with which it does agree, we find the sentence saying that motion is the actuality *as which* it is the potentiality of the potentiality, or *the actuality as a potentiality of the potentiality*. This, [Sachs’], reading of the definition implies that potentialities exist in two ways, that it is possible to *be* a potentiality, yet not be an actual potentiality. (Sachs 1976, 16-17 emphasis mine)

The two senses of potentiality are “an actuality, qua potentiality, of a potentiality” (motions) and “an actuality, qua actuality, of a potentiality” (bronze as bronze).

In a sense there are actual potentials (motions) and potential potentials (bronze as bronze).²⁰⁶ This chunk of bronze insofar as it is an independent being with all

²⁰⁵ It is not surprising that some subtle grammatical distinctions in the greek text would escape Aquinas given that, as it is generally supposed, he had no knowledge of the greek language and worked primarily (if not entirely) with latin translations of Aristotle. This makes Aquinas’ sense for interpreting Aristotle all the more uncanny.

²⁰⁶ Terry Penner offers an alternative interpretation which reads in the definition of motion not an ambiguity in the term δύναμις but rather in the term ἐνέργεια. Penner criticizes Ackrill and Ross on the grounds that they make no sense of the distinction between κίνησις and ἐνέργεια. “So far from being ‘potency’ that has two readings in the

of its positive attributes is, in a derivative sense, potentially a statue. But it is not a potentiality in the same way that the bronze is when it is considered as the privation of *another* form, in this case the form of a statue. It is this state of privation that the “as such” clause allows us to identify. Motion is the privative way of being in which an actual being is present as potentially something else. When the actuality of that privation is present as a privation (and not taken as some being independent of the end state of the change) that actuality or state or way of being is motion. If we understand the various “as such” phrases to modify not τοῦ δυνατοῦ or τοῦ ὄντος but rather ἐντελέχεια or ἐνέργεια, the definition of motion picks out an actuality the very actuality of which is a potentiality.

This reading is further supported by Aristotle’s careful substitution of δυνατόν for δύναμις in formulation (3), the last occurrence of the troublesome “as such” clause: ἡ τοῦ δυνατοῦ, ἡ δυνατόν, ἐντελέχεια φανερόν ὅτι κίνησις ἐστίν (201b4-5). By not using δύναμις he relieves us of the ambiguity of gender (cf. 201b4). This is the only place in this context where Aristotle substitutes δυνατόν (a neuter substantive adjective) for δύναμις (a feminine third declension noun) which are used synonymously. This substitution requires a reading of ἡ δυνατόν as a modification of ἐντελέχεια and not τοῦ δυνατοῦ. If he had written “ἡ τοῦ δυνατοῦ, ἡ δύναμις, ἐντελέχεια” the antecedent of the ἡ δύναμις would have been ambiguous (in that it could refer to ἐντελέχεια or δύναμις) and would

passage, it is *energeiai*, or as I shall henceforward call it, ‘actualization,’ that has two readings – and it is the function of the ‘*qua*’ clause to make clear which of these two readings it has” (Penner 1970, 429-31). Even some of the proponents of the process view find Penner’s appeal to two senses of ἐνέργεια unconvincing and “arbitrary” (cf. Kostman 1987, 7).

have allowed both Aquinas' reading or Kosman's and Sachs'. Aristotle's use of the neuter δυνατόν reconfirms the claim that the grammar of the relevant formulations of the definition of motion prohibit the modification of ἐντελέχεια or ἐνέργεια by the "qua" or "as such" (i.e. both types of clauses marked by ἥ) clause and requires that it modify δύναμις. This supplies definitive grammatical evidence against the process-view in favor of the actuality-view.

4.4 Motion as Potentiality and Substantial Generation

As indicated at the beginning of the chapter, the question posed in *Physics* V concerning the definition of motion and the intelligibility of substantial generation is whether this definition can be applied to the generation of substances. Our analysis of the definition of motion shows the critical role that the concept of potentiality plays. In previous chapters, I have shown that the central difficulty with respect to substantial generation is how potentiality and substrate should be understood (cf. especially *Physics* II.1 & V.1, and *On Generation and Corruption* I). It should therefore be clear that understanding the role of potentiality will shed light on the present problem of whether the definition of motion is applicable to substantial generation.

Aristotle's definition of motion explicitly distinguishes between two meanings of potentiality. One relates to motion and the other relates to beings existing in potentiality only. In other places Aristotle employs also a third concept of potentiality which is present when a being is fully actualized. In this last sense potentiality is not destroyed but perfected in a change and in a way this

potentiality is preserved and remains in the fully actual being. The way that the potentiality is preserved (remains, is perfected, etc.) when the form is fully actual is different from the way the potentiality is preserved while there is still motion toward the form or full actuality. These are both in turn different from the potentiality which exists before the motion begins. These three modes of potentiality can be gleaned from the distinction made by the "as such" clause by picking out the one that corresponds to motion:

- 1) Before the motion begins: the actuality of a potentiality as a potentiality. The bronze is actually there, not doing much except waiting to *really* become the potentiality to be a statue (i.e. waiting to be in motion).
- 2) During the motion: the actuality as a potentiality of a potentiality. The bronze is now actually (the bronze exists as...) the potentiality to be the statue.
- 3) Once the motion is complete: the actuality of a potentiality *as an actuality*. The bronze is now actually the statue.²⁰⁷

Aristotle addresses the difficulty of the first way of understanding potentiality in *On Generation and Corruption* I. There Aristotle presents an *aporia* concerning what a potential substance could actually be (e.g. what attributes it could have) if there is not yet an actual substance and in this case the context is primarily

²⁰⁷ Even though the example is of an artifact, each of these also pertains to the phenomenon of substantial generation in its more proper manifestations, e.g. in living beings. I have emphasized the dissimilarity of the coming-to-be of artifacts in from that of genuine substances in my analysis of *Physics* I.7 claiming that although it appears to some as if Aristotle is using the coming-to-be of the statue as an example of substantial generation he is really highlighting the difference between the nature of the material substrate involved in each. In the context of the definition of motion however, because the question of the substrate is not at issue, the analogy between substantial generation and the coming-to-be of artifacts is stronger.

concerned with problems of substrate. The third view of potentiality finds its best articulation in the domain of biology, namely in Aristotle's definition of soul in the *De Anima* where he says, "soul is substance as form of a natural body having life in potentiality" (412a19-21; translation from Polansky 2007, 154). Although the point is illustrated in many places in the corpus, living beings show more dramatically than non-living beings the way in which potentialities are still present and are at work in a fully actualized being. There is of course a strong analogue in the case of an artifact like a bronze statue in which the bronze of the actual being must retain its potentiality to be a statue (e.g. its characteristic rigidity, etc.) if the statue is to remain a statue. But since the bronze is 'inert' in the final product, its potentialities that remain are much less visible than those of a living being in which those potentialities of the body are constantly 'at work'.

In contrast to these potentialities which exist before and after motion takes place, the potentiality that exists (or better, *the way* in which that potentiality exists) during a motion is more difficult to identify or describe. The peculiar difficulty stems from the fact that in substantial change it is the material substrate identified with the potentiality in question that undergoes transformation. In the case of artifacts, the enduring potentiality in question was identifiable precisely as the material substrate which was easily identifiable as the same in the *terminous a quo* and the final product. In the case of the bronze statue, at both ends the bronze retains the same characteristics that identify it as a substrate containing a certain set of potentialities. In the case of an actual living thing, the body is a more or less constant material substrate that also exhibits a certain set of potentialities through the activities of the soul.

The difficulty with living things is that the *terminous a quo*, that from whence they came, *while it may contain the very same potentialities present in the fully actualized being*, does not exhibit those potentialities in a material substrate that resembles the material substrate that is present in the fully formed living being. The problem as it has traditionally been formulated has been trying to identify the substrate as a persisting material continuant with potentiality as such. This is a slightly more complex way of stating the problem of the substrate as a continuant that we have been dealing with since our reading of *Physics* I.7. However, now that we have the concepts of potentiality and actuality at our disposal, we are in a position to reorient the problem in a way that relieves us of much of its perplexity. The simple way of stating it is this: if we are looking for some constant in the case of substantial generation, perhaps we should not look for an identical material present at the beginning and end of the process but *the potentialities or capacities that are present throughout the process and even remain in the completed being*. The question becomes one of identifying potentialities which as we have seen can have different modes of actuality at each of the three stages of change. This approach can go a long way toward resolving the problems of substantial generation and even confirms the existence of Aristotle's "second solution" to the Eleatic paradoxes of motion alluded to in *Physics* I.8.

Conclusion

Since the advent of modern science, Aristotle's investigations in the natural sciences have largely been dismissed by philosophers and scientists alike as relics of a bygone era. This dismissal is largely due to a shift in the motivations which historically guided the study of nature. This shift is exemplified by Descartes who declared that the aim of scientific knowledge is the mastery of nature for the sake of practical human ends. The study of nature is not for the sake of understanding nature as it is in itself and humankind's place in it but rather for the sake of subjugating the forces of nature to the will of man. For moderns impressed by the technological successes of the modern sciences, the motivations of the ancient natural scientist are almost wholly eclipsed by our fascination with the powers we currently enjoy. This fascination, unfortunately, can prevent us from understanding the importance of those investigations into nature which lie at the foundation of western culture. Even if only a remnant of that original drive which conceived the first investigations into nature survives today, it is important to hold open the possibility that the earliest attempts to understand nature harbor important insights about physical reality which are overlooked or even inaccessible by the modern sciences.

It is endemic to many contemporary treatments of Aristotle that they hold him to certain standards set by modern science and philosophy. What we must

come to appreciate is that though many of the details of Aristotle's natural philosophy are now thought to be falsified by experiment and observation, often Aristotle is engaging with different *sorts* of questions than we are accustomed to ask. Clear examples of this are Aristotle's inquiries into what motion is, what place is, what time is, etc. These involve *types* of questions almost entirely foreign to the modern scientist who takes for granted that such questions are answered in advance insofar as they are prerequisite to any progressive scientific research.²⁰⁸ Even if the modern scientist would not admit that there is something like an 'essence' of motion, she necessarily operates under some assumption of what the idea of motion means even if it conceived as merely a relation between objects. In order to try to reawaken a sense of the importance of these sorts of questions, we must try to understand what motivates Aristotle to take up these kind of investigations.

The history of natural philosophy in the ancient world is a complex narrative of competing views each seeking to lay hold of some elusive truth about an inconstant world. Aristotle arguably stands as the culmination of this historical narrative having provided a foundation for the investigation into nature which would last for millennia. In the dissertation I have tried to make clear the connection between Aristotle's attempt to lay the groundwork for natural philosophy and the specific problem of the generation of substances. The central focus maintained throughout the dissertation was the paradox that confronted

²⁰⁸ Even more foreign to the modern scientist is idea of the necessity to investigate the very foundations and presuppositions of their practice without assuming in advance their legitimacy. But even for Aristotle these considerations may not properly reside within the domain of physics though he clearly recognizes the importance of addressing such questions before the investigation into nature begins (cf. *Physics* I.2).

Aristotle and his contemporaries which concerns the very possibility of the intelligibility of becoming. In book one of the *Physics*, Aristotle identifies this fundamental impasse as a problem that Parmenides posed and which still strikes the modern ear as a salient difficulty: It appears that something can come to be neither from what-is nor from what-is-not, for what-is need not come to be insofar as it already is, and what-is-not cannot come to be inasmuch as it is nothing at all.

This Eleatic paradox stood as a direct obstacle to the establishment of a science of nature. Some natural philosophers responding to Parmenides found their way around the impasse by ignoring one horn of the dilemma. Empedocles and Democritus, for example, while they agreed with Parmenides that something could not come into being from nothing, found a way to make sense of the possibility that something could come to be from what already is. Thus they gave an account of generation in terms of the change in arrangement of immutable units of matter. Since these irreducible elements neither come to be nor pass away, they could account for coming into being as the rearrangement of what already is. When something comes to be, it comes to be from what already is though the subjects of change are never themselves generated or destroyed. Thus they avoid half the problem by showing how change is not a coming into being from nothing. The atomists did not distinguish between this sort of generation and the positional change of the various arrangements of atoms. They did not accept as Aristotle did that there were genuine substances and much less the coming into being of these.

Aristotle realized that in order to defend natural philosophy from its critics, he would have to give an account of what seems to be the most natural of all processes, i.e. the birth and growth of natural beings. In order for Aristotle to maintain the idea that there are genuine substances and at the same time hold that the phenomenon of natural generation of these substances was intelligible, he was faced with the task of overcoming both horns of the Parmenidean paradox. This means he had to show a way in which something could indeed come to be from what-is-not, just as the atomists had shown that what comes to be can come from what-is. In the end, Aristotle has difficulty including the phenomenon of generation in the science of nature by means of an account that is common to all types of change. It is precisely this difficulty that interested us throughout the dissertation.

As Aristotle understands the problem, what is at stake is the very possibility of natural philosophy as a genuine science. If change in its most observable manifestations cannot be understood in a way that would defeat the Eleatic challenge to the intelligibility of nature, the body of knowledge which it founds will by extension be subject to the same objections. It is thus imperative in Aristotle's eyes to overcome this problem if the study of nature can be expected to yield anything more than mere opinion. It is clear from works like *Generation of Animals* and *On Generation and Corruption* that Aristotle does in practice consider substantial change to fall within the scope of natural science. Yet, only after the arguments in the opening chapters of the *Physics* which establish the scientific legitimacy of natural philosophy could these be considered investigations which could yield genuine knowledge.

Over the course of the dissertation, I have traced the development of the problem of substantial generation from its origins in the thought of the presocratics to Aristotle's proposed solutions in the physical writings. Chapter one began by demonstrating that the epistemological status of natural philosophy was at stake at least since the work of the Milesians was called into question by the Eleatics. The Eleatic critique of the first attempts at the study of nature set the stage for Aristotle's effort to establish natural philosophy as a rigorous science. Through our detailed analysis of the first book of Aristotle's *Physics*, we have seen that Aristotle's solutions to the problem of substantial generation are not unproblematic. It was shown that the three-principled account of change Aristotle presents, at least as it is traditionally interpreted, falls short of providing a definitive solution to the problem of substantial generation. Further, even Aristotle's attempt to solve the problem of substantial generation by considering it as a case of generation *per accidens* was found to be lacking in that it did not seem plausible that Aristotle would admit that generation *only* takes place by concomitance or accident.

While the problem had fully come into focus by the end of the analysis of *Physics* I, it was not yet clear that Aristotle had provided an adequate solution to the Parmenidean dilemma in such a way that would guarantee the legitimacy of further investigations into nature. Aristotle did however leave us with the hint that there was an alternate approach to the problem in the form of an account in terms of potentially and actuality. My interpretation of Aristotle's definition of motion in *Physics* III is an attempt to locate that alternate account of generation.

First it was established that the definition is applicable to the phenomenon at issue. There was cause for concern here given Aristotle's claim in *Physics* V that substantial generation was not properly a motion (κίνησις) but rather belonged to the more general class of change (μεταβολή). However, upon analysis, the generality of the definition of motion reassured us not only that it was safe to conclude that substantial generation could be understood in terms of the definition of motion, but that the definition of motion could provide much needed insight into substantial generation through its employment of the idea of potentiality. We found that the definition of motion provided the necessary framework for understanding how the idea of potentiality applied to substantial generation. In particular, it allowed a resolution to the difficulty of identifying some persistent aspect of the substance undergoing generation. What the definition of motion allowed us to see is that the same potentialities persist through generation even though the underlying material changes. Since the same potentiality can manifest in different ways, it is not necessary that when a potentiality persists that it always reveal itself in the same way. For example, the nutritive capacity which is present from the very beginning of embryonic transformation and remains throughout the existence of the living substance but is not always actualized in the same way. Before a living thing reaches full maturity the nutritive capacity acts only to maintain metabolism and growth whereas once it is mature the same nutritive capacity shows itself in the ability to reproduce as well. Once we begin looking for persisting potentialities rather than identical material substrates, the problem of the continuity of substantial generation is at least partially resolved.

In the context of contemporary scholarship, the present work has sought to bring attention to often overlooked aspects of Aristotle's argumentative rhetoric and to passages that are sometimes ignored because they are difficult to fit into an orthodox Aristotelianism. This is especially evident in the first two chapters where I explored the character of Aristotle's deep and conscious relationship with the tradition of natural philosophy which he inherited. This dissertation makes its most significant and original to Aristotle scholarship through its interpretation of *Physics* I.8. I do not claim to have fully understood this passage, but I think I have made headway on the interpretation of a text that is notoriously difficult and widely neglected in the discussion of Aristotle's view of change.

One of the primary theses of the dissertation is that Aristotle's idea of potentiality as employed the definition of motion is the key to understanding the generation of substances. We have dealt almost exclusively with how the problem of generation relates to potentiality and material substrates. However, we have not considered the difficulties that arise when one considers the problem from the point of view of form and actuality. An investigation into question of the generation of form would be a fitting complement to the research undertaken in present work.

The discussion of Plato has been almost entirely absent. Yet, Aristotle's defense of natural science is not only from the attacks of the Eleatics but is also attempt to overcome Plato's more sophisticated condemnations of the study of nature. Determining Plato's views about the viability of natural philosophy is complicated in much the same way as it is for Parmenides'. For, even though

Plato's Socrates abandons and belittles the study of nature (e.g. the Second Sailing of the *Phaedo* and Socrates' disparaging remarks about nature in the *Phaedrus*), Plato's *Timeaus* puts a great deal of effort into developing an account of nature. Of course, even with Socrates' praise throughout the *Timeaus*, there remains the important caveat to the account that it is at best a 'likely story'. Of course it is plausible, as the dissertation has hinted on occasion, that Aristotle to a great extent may share this view. Still, it is clear that Aristotle took more seriously than either Parmenides or Plato the idea that something important could be learned from nature.

One issue that was not explored in depth is whether Parmenides would have been amenable to a solution to the paradox of motion in terms of potentiality and actuality. It is not clear that Parmenides would even think that the idea of potentiality was intelligible insofar as it includes the idea of non-being. Can an account of change and substantial generation in terms of potency and act provide anything more than an adequate description of the phenomenon? More specifically, can an account of change in terms of potency and act provide explanatory power to an argument aiming to overcome the Eleatic paradox? If we say the Eleatic paradox stands refuted because things that change move from potency to act, have we done anything but beg the question without shedding light on *how* this transition from potency to act was possible? Would Aristotle be subject to the same criticism Nietzsche made of Kant when he claimed that the solution to the problem of how synthetic *a priori* judgments were possible was "by virtue of a faculty"? How are synthetic *a priori* judgments possible? By

virtue of a faculty. How is change from what-is-not possible? By virtue of a potency?

Aristotle's idea of potentiality is precisely a way to speak about non-being, or better, a being insofar as it is not. In much the same way the Plato's stranger renames non-Being as the Other in the *Sophist*, Aristotle renames what-is-not as potentiality. Interestingly, in the same arguments from the *Sophist* the Eleatic stranger says that Being is power or potentiality (δύναμις) which seems to be the exact inversion of Aristotle's designation of potentiality as non-being. It would be a worthwhile pursuit to establish a genealogy of the concept of potentiality from Parmenides to Plato to Aristotle. If Aristotle could convince Parmenides of the intelligibility of the idea of potentiality, he might persuade him that all kinds of change can be understood in turn. Still, it seems unlikely that Parmenides would not detect non-being under the thin veil of Aristotle's notion of potentiality and would therefore not accept our solution to the paradox of generation.

One of the overarching goals of this dissertation has been to gain insight into what Aristotle sees as the limits of scientific research into nature. If the arguments are sound or are at least collectively persuasive, they will have led the reader to some unorthodox views about Aristotle's contribution to natural philosophy. As my analysis of *Physics* I shows, Aristotle was extremely sensitive to problems concerning the very possibility of the project he invested so much of his life pursuing. A consequence of this is that often what appear to be his considered views turn out to be much less doctrinaire than is often supposed. If, contrary to the views of orthodox Aristotelianism, it can be shown that Aristotle's arguments about nature are frequently made on an aporetic and sometimes even

tentative basis, we will find that what are often taken to be Aristotle's considered views are actually more or less refined positions meant to open new paths for thinking in the reader. This claim, if true, would reorient the common assumption that Aristotle's writings are statements of dogmatic science to an understanding of them as dialectical inquiries in which the reader is not always meant to grasp a doctrine but instead is led toward thinking through philosophically fundamental problems on their own.

Bibliography

1. Ackrill, J. L. (1965). "Aristotle's Distinction Between *Energeia* and *Kinesis*." 121-42 in New Essays on Plato and Aristotle ed. R. Bambrough. London, Routledge & Kegan Paul.
2. Angioni, L. (2001). "Explanation and Definition in *Physics* I.1." Apeiron: A Journal for Ancient Philosophy and Science 34(4): 307-320.
3. Aquinas (1999). Commentary on Aristotle's *Physics* trans. R. J. Blackwell, R.J . Spath, W.E. Thirlkel. Notre Dame, Dumb Ox.
4. Aristotle (1999). On Coming-to-Be & Passing-Away ed. H. Joachim. Oxford, Clarendon Press.
5. --- (1936). Aristotle's *Physics*: A Revised Text with Commentary ed. W.D. Ross. Oxford, Clarendon Press.
6. --- (1970). Aristotle's *Physics* Books I and II trans. W. Charlton. Oxford, Clarendon Press.
7. --- (1982). Aristotle's *De Generatione et Corruptione* trans. C.F.J. Williams. Oxford, Clarendon Press.
8. --- (1984). The Complete Works of Aristotle : The Revised Oxford Translation ed. J. Barnes. Princeton, N.J., Princeton University Press.
9. --- (1991). Aristotle's *Physics* (unpublished draft of translation with notes by J. Sachs). Annapolis, St. John's College.
10. --- (1995). Aristotle's *Physics*: A Guided Study trans. J. Sachs. New Brunswick, Rutgers University Press.
11. Bambrough, R., ed. (1965). New Essays on Plato and Aristotle. London, Routledge & Keagan Paul.
12. Barnes, J., Schofield, M. and Sorabji, R., ed. (1975). Articles on Aristotle: Science. London, Duckworth.
13. Blair, G. (1992). *Energeia* and *Entelecheia*: Act in Aristotle. Ottawa, University of Ottawa Press.
14. Bolotin, D. (1998). An Approach to Aristotle's *Physics*: With Particular Attention to the Role of His Manner of Writing. Albany, SUNY Press.

15. Bolton, R. (1991). "Aristotle's Method in Natural Science: *Physics* I." 1-30 in Aristotle's *Physics*: A Collection of Essays ed. L. Judson. Oxford, Oxford University Press.
16. Bostock, D. (1982). "Aristotle on the Principles of Change in *Physics* I." 179-96 in Language and Logos. ed. M. Schofield and M. C. Nussbaum.
17. --- (1995). "Aristotle on the Transmutation of Elements in *De Generatione et Corruptione* I.1-4." 217-29 in Oxford Studies in Ancient Philosophy vol. XIII. ed. D. Sedley. Oxford, Oxford University Press.
18. Brisson, L. (2004). How Philosophers Saved Myths : Allegorical Interpretation and Classical Mythology. Chicago, University of Chicago Press.
19. Broadie, S. (1982). Nature, Change, and Agency in Aristotle's *Physics* : A Philosophical Study. Oxford, Clarendon Press.
20. Burnet, J. (1932). Greek Philosophy from Thales to Plato. London, Macmillan.
21. Burnyeat (2004). "Aristotle on the Foundations of Sublunary Physics" in Aristotle: *On Generation and Corruption*, Book I, Symposium Aristotelicum ed. F. De Hass and J. Mansfeld.
22. Charlton, W. (1983). "Prime Matter: A Rejoinder." Phronesis: A Journal of Ancient Philosophy 28: 197-211.
23. Cherniss, H. F. (1944). Aristotle's Criticism of Plato and the Academy. Baltimore, Johns Hopkins Press.
24. --- (1964). Aristotle's Criticism of Presocratic Philosophy. New York, Octagon Books.
25. --- (1970). "The Characteristics and Effects of Presocratic Philosophy." Studies in Presocratic Philosophy ed. D. Furley and R. E. Allen. New York, Humanities Press.
26. Code, A. (1976). "The Persistence of Aristotelian Matter." Philosophical Studies: An International Journal for Philosophy in the Analytic Tradition 29: 357-67.
27. Cook, K. C. (1989). "The Underlying Thing, the Underlying Nature and Matter: Aristotle's Analogy in *Physics* I 7." Apeiron: A Journal for Ancient Philosophy and Science 22(4): 105-119.
28. Dancy, R. (1978). "On Some of Aristotle's Second Thoughts About Substances: Matter." Philosophical Review 87: 372-413.

29. Detienne, M. (1999). The Masters of Truth in Archaic Greece trans. J. Lloyd. New York, Zone Books.
30. Diels, H. and Kranz, W. eds. (1922). Die Fragmente der Vorsokratiker. Berlin, Weidmannsche Buchhandlung.
31. Dodds, E.R. (2004). The Greeks and the Irrational. Berkley and Los Angeles, University of California Press
32. Empedocles (2001). The Poems of Empedocles: A Text and Translation with an Introduction trans. B. Inwood. Toronto, University of Toronto Press.
33. Freeman, K. (1971). Ancilla to the Pre-Socratic Philosophers. Oxford, Basil Blackwell.
34. Furley, D. and Allen, R. E. (1970). Studies in Presocratic Philosophy: The Beginnings of Philosophy. New York, Humanities Press.
35. Gadamer, H. G. (2001). The Beginning of Philosophy trans. R. R. Coltman. New York, Continuum.
36. --- (2002). The Beginning of Knowledge. trans. R. R. Coltman. New York, Continuum.
37. Gershenson, D. E. and Greenberg, D. A. (1962). "Aristotle Confronts the Eleatics: Two Arguments on 'The One'." Phronesis 7 (1): 137-51.
38. Gill, M. L. (1980). "Aristotle's Theory of Causal Action in *Physics* III.3." Phronesis: A Journal of Ancient Philosophy 25: 129-47.
39. --- (1989). Aristotle on Substance: The Paradox of Unity. Princeton, Princeton University Press.
40. Gotthelf, A. ed. (1987). Philosophical Issues in Aristotle's Biology. Cambridge, Cambridge University Press.
41. --- (1987). "First Principles in Aristotle's *Parts of Animals*." Philosophical Issues in Aristotle's Biology. Cambridge, Cambridge University Press.
42. Haas F. and Mansfeld, J. ed. (2004). Aristotle: On Generation and Corruption, Book I, Symposium Aristotelicum. Oxford, Oxford University Press.
43. Heath, T. L. (1981). A History of Greek Mathematics. New York, Dover Publications.
44. Hegel, G. W. F. (1995). Lectures on the History of Philosophy. Lincoln, University of Nebraska Press.

45. Heidegger, M. (1993). Basic Writings ed. D.F. Krell. New York, Harper & Row.
46. --- (1995). Aristotle's Metaphysics Θ 1-3 : On the Essence and Actuality of Force trans. W. Brogan. Bloomington, Indiana University Press.
47. --- (1997). Plato's *Sophist* trans. R. Rojcewicz and A. Schuwer. Bloomington, Indiana University Press.
48. --- (2008). Basic Concepts of Ancient Philosophy trans. R. Rojcewicz. Bloomington, Indiana University Press.
49. Heidel, W. A. (1980). "Qualitative Change in Pre-Socratic Philosophy." Selected Papers. New York and London, Garland Publishing.
50. Heinaman, R. (1994). "Is Aristotle's Definition of Change Circular?" Apeiron: A Journal for Ancient Philosophy and Science XXVII (March): 25-37.
51. Hesiod (1914). Theogony trans. H. G. Evelyn-White. Loeb Classical Library.
52. Hintikka, J. (1977). Aristotle on Modality and Determinism. Amsterdam, Published for Societas Philosophica Fennica by North-Holland Publishing Company.
53. Homer (1965). The Odyssey of Homer trans. R. A. Lattimore. New York, Harper & Row.
54. Husserl, E. (1970). The Crisis of European Sciences and Transcendental Phenomenology : An Introduction to Phenomenological Philosophy trans. D. Carr. Evanston, Northwestern University Press.
55. Jones, B. (1974). "Aristotle's Introduction of Matter." The Philosophical Review 84 (4): 474-500
56. Judson, L., ed. (1991). Aristotle's *Physics*: A Collection of Essays. Oxford, Clarendon Press.
57. Kahn, C. H. (1960). Anaximander and the Origins of Greek Cosmology. New York, Columbia University Press.
58. Kelsey, S. (2006). "Aristotle *Physics* I.8." Phronesis: A Journal of Ancient Philosophy 51(4): 330-61.
59. King, H. R. (1956). "Aristotle without *Prima Materia*." Journal of the History of Ideas 17: 370-89.

60. Kingsley, P. (1997). Ancient Philosophy, Mystery and Magic. Empedocles and Pythagorean Tradition. Oxford, Oxford University Press.
61. --- (1999). In the Dark Places of Wisdom Inverness, Golden Sufi Center.
62. --- (2002). "Empedocles for the New Millennium." Ancient Philosophy 22: 333-413.
63. Kirk, G. S. (1970). "Some Problems in Anaximander." Studies in Presocratic Philosophy: The Beginnings of Philosophy. ed. D. Furley and R. E. Allen. New York, Humanities Press.
64. Kirk, G. S., Raven, J. E. and Schofield, M. (1983). The Presocratic Philosophers : A Critical History with a Selection of Texts. Cambridge, Cambridge University Press.
65. Kosman, L. A. (1969). "Aristotle's Definition of Motion." Phronesis: A Journal of Ancient Philosophy 14: 40-62.
66. Kostman (1987). "Aristotle's Definition of Change." History of Philosophy Quarterly 4(1): 3-16.
67. Lacey, A. R. (1965). "The Eleatics and Aristotle on Some Problems of Change." Journal of the History of Ideas 26: 451-68.
68. Laërtius, D. (1925). Lives of Eminent Philosophers. trans. R. D. Hicks. Cambridge, Harvard University Press.
69. Lennox, J. (1984). "Recent Philosophical Studies of Aristotle's Biology." Ancient Philosophy 4: 75-82.
70. --- (1987). "Divide and Explain: The *Posterior Analytics* in Practice." Philosophical Issues in Aristotle's Biology. ed. A. Gotthelf. Cambridge, Cambridge University Press.
71. --- (2001). Aristotle's Philosophy of Biology: Studies in the Origins of Life Science. Cambridge, Cambridge University Press.
72. Leshner, J. H. (1983). "Xenophanes' Scepticism." Society for Ancient Greek Philosophy. ed. A. Preus. Albany, State University of New York Press.
73. Lettinck, P. (1994). Aristotle's *Physics* and its Reception in the Arabic world : with an Edition of the Unpublished Parts of Ibn Bāajja's Commentary on the *Physics*. Leiden, E.J. Brill.
74. Lewis, F. (1991). Substance and Predication in Aristotle. Cambridge, Cambridge University Press.

75. Liddell, G., Jones, H.S., and Scott, R. ed. (1996). A Greek-English Lexicon. Oxford, Clarendon Press.
76. Long, A. A. (1999). The Cambridge Companion to Early Greek Philosophy. New York, Cambridge University Press.
77. Loux, M. (1992). "Aristotle and Parmenides: An Interpretation of Physics A.8." Proceedings of the Boston Area Colloquium in Ancient Philosophy 8: 281-319.
78. Madigan, A. R. (1992). "Commentary on Loux's Aristotle and Parmenides: An Interpretation of Physics A.8." Proceedings of the Boston Area Colloquium in Ancient Philosophy 8: 320-7.
79. Maimonides, M. (1963). The Guide of the Perplexed, trans. S. Pines. Chicago, University of Chicago Press.
80. Mansfeld, J. (1990). Myth, Science, Philosophy: A Question of Origins. Studies in the Historiography of Greek Philosophy. The Netherlands, Assen-Maastricht: 1-29.
81. McDiarmid, J. (1953). "Theophrastus on the Presocratic Causes." Harvard Studies in Classical Philology 61: 85-156.
82. Menn, S. (1994). "The Origins of Aristotle's Concept of *Energeia*: *Energeia* and *Dunamis*." Ancient Philosophy 14: 73-114.
83. Mourelatos, A. (1981). "Pre-Socratic Origins of the Principle that There are No Origins from Nothing." The Journal of Philosophy 78 (11): 649-65.
84. Nietzsche, F. W. (2001). The Pre-Platonic Philosophers, trans. G. Whitlock. Urbana, University of Illinois Press.
85. Nussbaum, M. C. (1982). "Saving Aristotle's Appearances." 267-93 in Language And Logos, ed. M. Schofield and M. C. Nussbaum.
86. Owen, G. E. L. (1975). "*Tithenai ta Phainomena*." 239-51 in Articles on Aristotle: Science, ed. J. Barnes, M. Schofield and R. Sorabji. London, Duckworth. 1: 113-26.
87. Owens, J. (1951). The Doctrine of Being in the Aristotelian Metaphysics Toronto, Pontifical Institute of Mediaeval Studies.
88. Palmer, J. (2004). "Melissus and Parmenides" 19-54 in Oxford Studies in Ancient Philosophy XXVI (Summer).
89. Parmenides (1991). Parmenides of Elea: Fragments trans. D. Gallop. Toronto, University of Toronto Press.

90. Penner, T. (1970). "Verbs and the Identity of Actions - A Philosophical Exercise in the Interpretation of Aristotle." 393-460 in Ryle: a Collection of Critical Essays ed. O. P. Wood and G. Pitcher.
91. Philoponus, J. (1994). On Aristotle's Physics 3 trans. M. J. Edwards. Ithaca, Cornell University Press.
92. --- (1995). On Aristotle's Physics 5-8 trans. P. Lettinck. Ithaca, Cornell University Press.
93. --- (2006). On Aristotle's Physics 1.1-3 trans. C. Osborne. Ithaca, N.Y., Cornell University Press.
94. Polansky, R. (1983). "Energeia in Aristotle's *Metaphysics* IX." Ancient Philosophy III(2): 160-70.
95. --- (2007). Aristotle's De Anima New York, Cambridge.
96. Preus, A., ed. (1983). Society for Ancient Greek Philosophy. Albany, SUNY Press.
97. Ryle, G. (1954). Dilemmas Cambridge, England, University Press.
98. Sachs, J. (1976). "Aristotle's Definition of Motion." The College: unknown page range. A version is also available online: <http://www.iep.utm.edu/a/aris-mot.htm>;
99. Schofield, M. and Nussbaum, M. C., ed. (1982). Language and Logos. Cambridge, Cambridge University Press.
100. Sedley, D. (1999). "Parmenides and Melissus." 113-32 in The Cambridge Companion to Early Greek Philosophy. ed. A. A. Long. Cambridge, Cambridge University Press.
101. Simplicius (1997). On Aristotle's Physics 2 trans. D. B. Fleet. Ithaca, Cornell University Press.
102. --- (2002). On Aristotle's Physics 3 trans. J. O. Urmson and P. Lautner. Ithaca, Cornell University Press.
103. Solmsen, F. (1958). "Aristotle and Prime Matter: A Reply to Hugh R. King." Journal for the History of Ideas 19: 243-52.
104. Spangler, G. A. (1979). "Aristotle's Criticism of Parmenides in *Physics* I." Apeiron: A Journal for Ancient Philosophy and Science 13: 92-103.
105. Vernant, J. P. (2006). Myth and Thought among the Greeks New York, Zone Books.

106. Wieland, W. (1975). "Aristotle's *Physics* and the Problem of Inquiry into Principles." 141-60 in Articles on Aristotle: Science vol. 1. London, Duckworth.
107. Wolfson, H. A. (1971). Crescas' Critique of Aristotle: Problems of Aristotle's *Physics* in Jewish and Arabic Philosophy. Cambridge, Harvard University Press.
108. Wood, O. P. and Pitcher, G. (1970). Ryle: A Collection of Critical Essays. Garden City, Anchor Books.
109. Zeller, E. (1881). A History of Greek Philosophy from the Earliest Period to the Time of Socrates trans. S. F. Alleyne. London, Longmans.